ELECTRICAL REVIEW

ILLUSTRATED.

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Electric Light, Power, Telephone, Telegraph and Scientific Progress.

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VIEWS, NEWS AND INTERVIEWS.

The operation of cloth cutters by electricity is one of the latest novelties in the use of the electric motor on the market. Heretofore all revolving cutters have been operated by either steam power or a stationary electric motor. Where pulleys and belts are required, the operation of the knife is complicated. With the new system the knife and motor are all in one case, the current being supplied to the motor by a flexible cord. The speed of the armature is 2,000 revolutions per minute, and this is reduced two-thirds in the knife. There is but one of these machines in operation, and if it proves entirely successful, their general introduction is but a matter of time.

The statistics of electric railways are expanding at a great rate. About 500 street railroads in the United States and Canada are operated by electricity, a gain of nearly 200 in two years, and fully equal to one-half of the total railway system of America. The investments in these roads has passed the $200,000,000 mark, but gives no indications of falling off to a lower rate of increase. In February, 1891, the investments were estimated at $50,000,000, and in 1887 there were only 13 electric roads working throughout the entire country.

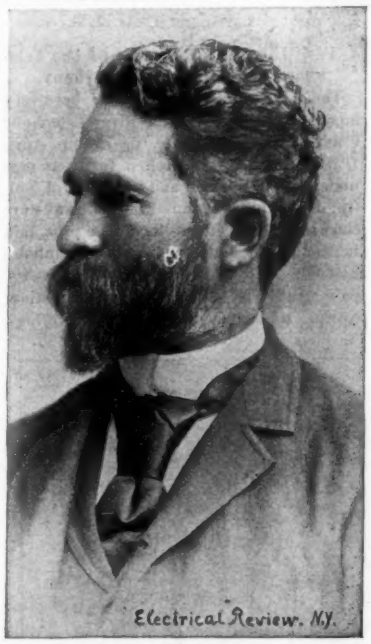
The electric light is being put to a variety of novel uses in England. Only recently the policemen in certain parts of London were provided with incandescent lamps instead of the cumbersome and inconvenient dark lantern, and it has just occurred to the custom house authorities that the possibility of an explosion while searching for contraband goods on board of tank and other vessels, carrying petroleum or explosives, may be materially lessened by the use of the electric light.

Photographers are now beginning to realize that the dark room lantern should become a relic of the past, and a number of the more progressive members of the fraternity are installing storage battery plants which operate a ruby-colored incandescent lamp. They say that this improvement has had a marked effect upon the health of dark room operators, and is considered a boon to those whose time is spent continually in that unwholesome atmosphere.

It is said that Oshkosh, Wis., received the presidential election returns by long distance telephone from New York one hour in advance of the telegraphic reports.

It is estimated that the Western Union Telegraph Company has 21,000 offices and opens an average of 600 new offices annually.

The statistics compiled by the International Telegraph Bureau, of Berne, show that there were despatched in Europe during the year 1891, 207,595,000 telegrams; in the remaining portion of the world, 88,422,000, making a total of 296,017,000 telegraphic communications in one year.



Henry L. Storke, Secretary and Treasurer Hudson River Telephone Company.

When a cowboy or an Indian goes to sleep on the prairie he uncoils his horsehair lariat and makes a circle around the blanket upon which he lies. Lately, some bright man has discovered a means by which, he says, caterpillars may be kept out of trees. He surrounds the trunk of the tree with a bare wire carrying a current. As a matter of fact the butterfly lays her eggs in the tree and the caterpillar is hatched in the foliage, so it is not exactly evident, on the surface, how it is possible for a wire carrying a current to affect the caterpillars that never have occasion to come near it.

Press Club Election.

The annual election of officers of the New York Press Club was held last week at the club house, 120 Nassau street. This event attracted much attention in press circles, a lively contest for first honors between Mr. John W. Keller, of the *Recorder*, and Mr. Foster Coates, of the *Commercial Advertiser*, bringing out a full vote. Both gentlemen are able and popular New York journalists, and possess many earnest friends, which made the campaign a lively but good-natured one. Col. John A. Cockerill, who for five years past has been the able and enthusiastic president of the club, and who declined to again be a candidate, was nominated by both sides for member of the board of trustees, and unanimously elected.

The following are the names of the officers elected:

President, John W. Keller; first vice-president, Charles O'Conor Hennessy; second vice-president, Murat Halstead; third vice-president, John Russell Young; treasurer, George F. Williams; financial secretary, George F. Lyon; recording secretary, Caleb H. Redfern; corresponding secretary, Charles Henry George; librarian, J. Frank Clark; trustees, John A. Cockerill, Joseph I. C. Clark, George F. Spinney, Thomas H. Evans, Charles F. Hart, Hermann Ridder, Jean Isadore Charlouis, Samuel C. Austin, Charles W. Price.

An Electric Retouching Pencil.

A modification of Edison's pen has been put upon the market for the purpose of retouching negatives. One method of reducing negatives is to treat the surface with any of the well-known reducing agents; but with this device negatives may be retouched in the simplest manner. A miniature motor is attached to the end of the pencil, and gives the pencil point, which is attached to the shaft of the armature, a very rapid motion. The apparatus is suspended by a spring immediately over the retouching box. The spring relieves the operator from the weight of the instrument, and it is simply necessary from him to draw at will on the surface of the film; the pencil point will do its own work, as no pressure is required.

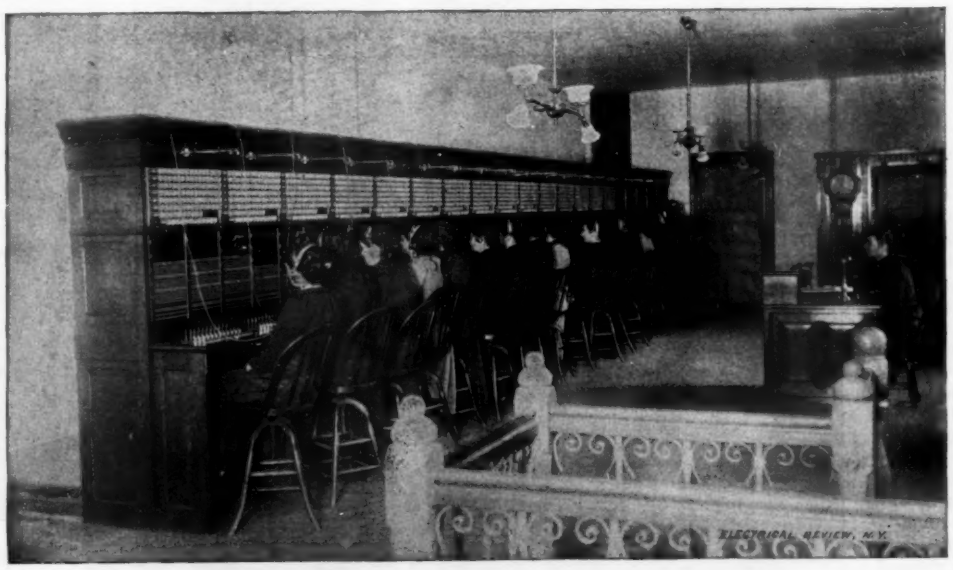


Fig. 1.—Hudson River Telephone Company.—View of New Exchange, with Operators at Work.

HUDSON RIVER TELEPHONE COMPANY.

The Modern Exchange at Albany, N. Y.—Improvements in the System Throughout the City.—History of this Pioneer Company, and of State Telephone Matters Generally.—First Printed List of Subscribers.—A Few Words About An Early and Able Telephone Promotor. — Illustrations of Exchange and Officers of the Company.

A history of the Hudson River Telephone Company and its predecessors in the important territory it occupies would, if fully written, give a comprehensive record of the telephone business from the beginning. A scientific toy in 1876, in 1878 it began to assume commercial importance, and a few exchanges were opened with crude apparatus, and limited and uncertain communication established. Among the first to feel the competition of the new instrument were the American District Companies, and many of them, in self-defense, undertook its exploitation. This was the case with the American District Telegraph Company, of Albany, which was early in the field. After a brief test of the business, the parties interest, in July, 1879, organized the Commercial Telephone Company, of Albany, which became the owner of the District Company, and secured control of 13 counties in Eastern New York.

The leading spirit in the enterprise was the late Andrew B. Uline, who took charge of the active work as general manager. With him were connected a number of the prominent business men of the city of Albany, among them the late Hon. Daniel Manning, secretary of the treasury; Mr. Walter F. Hurcomb, Hon. N. D. Wendell, state treasurer; J. I. Wendell, Edward Newcomb, Hon. J. M. Bailey and Mr. John Farrell.

Mr. Walter F. Hurcomb was elected president; Mr. J. I. Wendell became the secretary and treasurer, and Mr. Walter B. Butler was appointed cashier, a position he has held continuously since that time, through all the various re-organizations and consolidations incident to a new and changing business.

A *fac-simile* is presented in this issue of the first published list of parties connected at Albany, from which has grown the present system, with its thousands of subscribers, handling more than six millions of messages per year.

At about this time the territory south of the Albany district was being developed by a number of local companies, the Automatic Signal Telegraph Company, of Poughkeepsie, Hon. John I. Platt, president, and Samuel K. Ruply, manager, being the earliest in the field. This company was organized to do a messenger business and also to furnish fire alarms and other special signals. At the

suggestion of Mr. Platt, the telephone was substituted, and in point of time the Poughkeepsie Exchange ranks among the first half-dozen in the country.

The business at Newburgh was organized by Mr. James Bigler, associated with a number of prominent local people. Small exchanges were started at nearly all the places along the Hudson river, and at the time of the incorporation of the Hudson River Telephone and Telegraph Company the territory was fairly well developed. As the business increased and the battery transmitter came into general use, the demand arose for what is now known as extra-territorial and long distance service.

Mr. Henry L. Storke, who had been connected with the Gold and Stock Telegraph Company as the superintendent of its private line department, about this time obtained a controlling interest in the Poughkeepsie and Newburgh Exchanges, and recognizing the importance of this branch of the business, secured the construction of an extra-territorial line between those two cities, involving the purchase and laying of an expensive submarine cable across the Hudson river at New Hamburgh.

This immediately developed a large and profitable toll business, and formed the nucleus of the extensive system of trunk lines which now connects all the principal cities, towns and villages in Eastern New York.

The growth of communication between cities soon rendered the original plan for the operation of the telephone business by isolated companies and individuals, under independent licenses, covering in many cases but a single place, exceedingly troublesome and inconvenient. The business was hampered, and its extension checked by lack of co-operation and by rival interests. The law

A. B. ULINE, LATE GENERAL MANAGER HUDSON RIVER TELEPHONE COMPANY.

of gravitation soon compelled a union and consolidation of companies.

The first step in this direction in the Hudson river valley was through the organization of the Hudson River Telephone and Telegraph Company, with the following officers: James Bigler, president; Dexter A. Smith, vice-president; Henry L. Storke, secretary and treasurer.

The work of rebuilding and reconstructing the exchanges then in operation, placing new and improved apparatus, opening new exchanges and extending the extra-territorial system, was at once begun and pushed with vigor until the spring of 1883.

At this time successful negotiations were opened for the acquirement of the Albany district, and on their consummation, in April, 1883, the company was reorganized, the capital increased and the name changed to the Hudson River Telephone Company, with the following organization: James Bigler, president; Dexter A. Smith, vice-president; Henry L. Storke, secretary and treasurer; A. B. Uline, general manager.

This organization remained practically unchanged, with the exception of the election of A. B. Uline as vice-president in place of D. A. Smith, resigned, until March, 1888, when the number of directors was increased, and Messrs. C. J. French and Thomas Sherwin were added to the board.

On March 7, 1889, Mr. Bigler declining

HENRY E. HAWLEY, ACTING GENERAL MANAGER HUDSON RIVER TELEPHONE COMPANY.

re-election as president, Mr. Joseph P. Davis, one of the foremost electrical engineers in the country, was elected in his place.

Under his direction an extensive system of improvements and rebuilding was begun early in 1891, including the erection of an office building, the construction of one of the most complete underground systems in the country, the placing of new and improved metallic circuit switchboards at all the exchanges, and a change in all the principal toll lines of the company to the standard long distance equipment, with copper metallic circuits to all the larger places.

On April 4, 1892, the company sustained an irreparable loss in the death of its vice-president and general manager, Mr. Andrew B. Uline, a sketch of whose life and business career appeared in the REVIEW of April 16, 1892.

From this time on the execution of this work, then barely begun, was in charge of Mr. Henry E. Hawley, acting general manager, to whose energy and push its success is largely to be attributed.

The company is now officered as follows:

President, Joseph P. Davis.

Vice-president, James H. Manning.

Secretary and treasurer, Henry L. Storke.

Acting general manager, Henry E. Hawley.

Cashier, Walter B. Butler.

Electrician, Wm. H. Cull.

Attorney, John A. Delehanty.

Directors, Joseph P. Davis, New York city; James Bigler, Newburgh, N. Y.; Selden E. Marvin, Albany, N. Y.; David B. Parker, Randolph, N.Y.; Henry L. Storke, Auburn, N. Y.; C. J. French, Boston, Mass; Jas. H. Manning, Albany, N. Y.; D. Cady Herrick, Albany, N. Y.; John E. Hudson, Boston, Mass.

A Few Interesting Details of the Telephone Improvements at Albany.

The last eighteen months have been very busy ones for the Hudson River Telephone Company at Albany, N. Y. About April 1, 1891, ground was broken for their new underground system, and the work of putting in conduits begun. The subways are constructed of cement-lined iron pipe, laid in concrete, and brick-walled manholes erected. The cables used are usually 100 pairs, lead covered, dry paper insulation, except in portions of the city where high

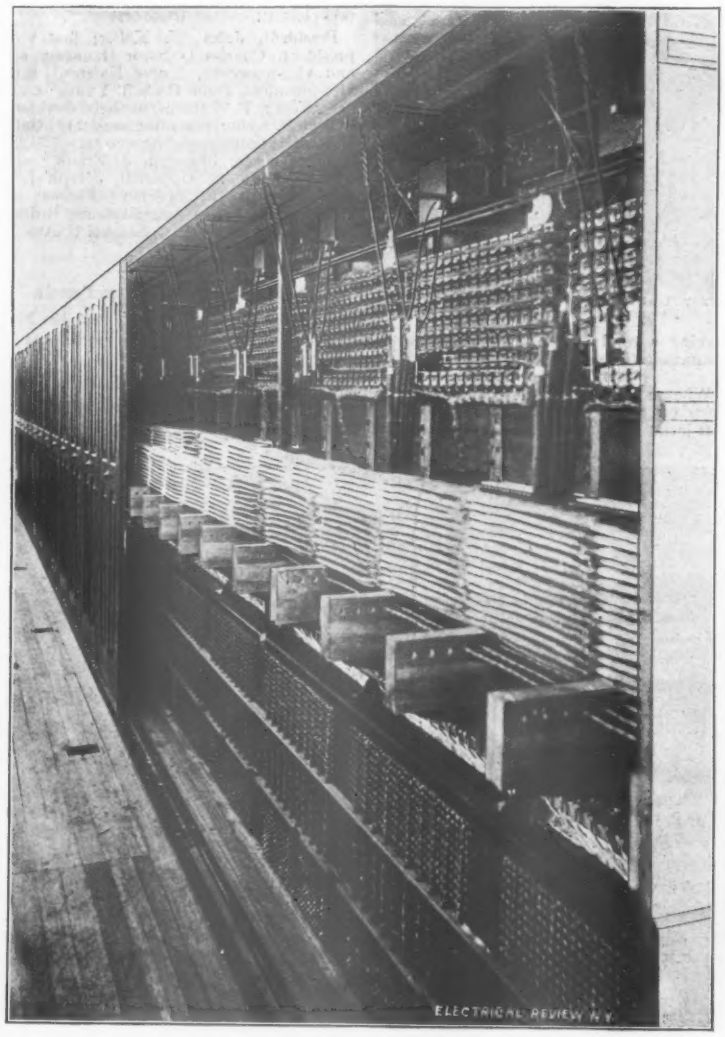


FIG. 2.—HUDSON RIVER TELEPHONE COMPANY.—VIEW OF BACK OF SWITCHBOARD.

water will submerge the manholes. These cables are filled core; the conductors are twisted in pairs. The method of supporting the cables in the Central office cable shaft is the same as that used by the New England Telephone and Telegraph Company.

Cable supports in manholes are two feet by six inches vertical creosoted pine posts secured to the walls by means of wedges drawn at top and bottom of supports; to these posts are attached cable hangers. The cables are protected up the cable pole for a distance of eight feet above the surface of the ground by three-inch wrought iron lateral pipe; from the upper end of lateral

Office of the
Commercial Telephone Co.,
551 Broadway,

Albany, July 28th 1879.

TO OUR PATRONS:

Below please find a list of those who are in communication with this system of telephone.

N. Y. C. & H. R. R. Elevator.
Battersby's Market, Cor. No. Pearl & Clinton Ave.
Newcomb & Bailey's, Office.
Clement & Rice, Cor. Broadway & Clinton Ave.
W. A. Graves, House and Office.
A. B. Uline, House and Office.
N. Y. C. & H. R. R. R. Freight Office.
Durant & Elmore.
Mc Donnald's, St. James 23 Norton St.
Carlisle & Hill, Tinroofers, 4 Van Tromp St.
James O'Byrne, 5 Van Tromp St.
F. D. Tower's, Mill and Office.
Fire Alarm, Superintendents Office.
Delevan House.
L. Dryer's, House and Office.
W. H. Meyers, Cigar Store, 4 So. Pearl St.
R. W. Thacher, House and Office.
American Express Office.
Weed Parsons & Co.
Dr. H. E. Mereness, 712 Broadway.
J. L. Van Valkenburgh, Ag't. Am. Exp, House.
Sam'l Schuyler, House.
Merchants Bank.
Benj. Payne, Cor. Maiden Lane and James St.
Day Boat Office.
Base-ball Grounds.
Ira S. Kinch, House and Office.

THE FIRST LIST OF SUBSCRIBERS OF HUDSON RIVER TELEPHONE COMPANY.—NOTICE THE DATE.

pipe to cable box the cable is protected by No. 24 galvanized sheet iron casing. The distributing poles are equipped with wrought iron rings, instead of cross-arms; these rings are of three-eighths of an inch angle

MAYOR J. H. MANNING, ALBANY, VICE-PRESIDENT HUDSON RIVER TELEPHONE COMPANY.

iron, and have places for 74 pairs of wires.

The underground cables are brought into the building, and terminate on the third floor in Okonite wires, which are carried direct to the distributing frame. In this exchange the multiple distribution of underground cables is adopted, wherein each cable conductor is made to end at two or more distributing points.

The distributing frame is the new No. 4

pattern, with protectors at switchboard side of frame. The board is made entirely of angle and bar iron. The vertical strips separating the main section of the board are of angle iron, and the horizontal strips of bar iron. Where the arresters are mounted on the board a "Merchant" bar of flat wrought iron is used. The whole board is arranged in sets of horizontal and vertical partitions completely open horizontally and vertically, so as to permit the wire to be led easily the entire length of the partitions. Upon the edges of the partitions are placed the terminals, one set upon the edge of the horizontal partition, the other set upon the edge of the vertical partition. A connection is made by a wire from a vertical or horizontal terminal to the hook on the partition of the desired terminal, through the hook, and horizontally and vertically to the second terminal. In this way the wire of each connection is bent but once—at the hook—and can be led on either partition directly to the hook without having to pass through any support. One set of connections is always on one side of the partition and the other set always on the other side. For instance, the cross connecting wires will always be on the right hand side of the vertical partition and on the upper side of the horizontal partition, while the switchboard and incoming terminals are always on the under side of a horizontal partition and on the left hand side of a vertical partition. In this way the three sets of connections are always kept separated, and abundance of space is allowed for handling cross connecting wires. Moreover, all confusion in cross connecting is avoided, as there can be but one possible path from one set of terminals to the other. Front and rear views of the switchboard are shown in Figs. 1 and 2.

The switchboard cables are carried vertically from the distributing board through the ceiling immediately over the distributing board, thence horizontally across the attic floor to cable box, in which they are conveyed down to the operating room. The cable run across the attic is partially protected from fire by having the boards nine inches in height covered on outside with asbestos cloth placed at sides and ends of run, the whole being covered with asbestos cloth.

The switchboard is of the new metallic circuit bridging-in type, with locking drops, and is the first of its kind to be placed in service in any exchange. This board is a marvel in design and construction, and it is hard, indeed, to imagine a switchboard more perfect in all its appointments, where annunciator drops are employed to indicate a subscriber's call, than this board is. The feature of the locking and self-restoring drops must be seen in actual operation to be fully appreciated.

The board is provided with an intermediate distributing board, running the entire length of the board, also with a special distributing board to admit all local wires terminating in cable form at one point, there distributed and carried to the different apparatus which they serve.

Before moving the old office to the new office, half connections were made between the new switchboard and all the subscribers. The cutting in of the new office was accomplished by opening the lines in the old office and closing them in the new office at a prearranged time. So complete was this arrangement that the change was made in two hours without any interference to the service, and when the lines were cut back into the old office it was done in 20 minutes, by three lady operators and one inspector; in fact, the lines were working in the old office before the chairs arrived from the new office for the operators.

After working in the new board for 48 hours it was demonstrated that the drops were too finely adjusted to withstand the earth leakage from the railway current, nearly 50 per cent. of the drops being down most of the time. A conference was held, consisting of Messrs. Hayes, of the American Bell Telephone Company, Carty, of the Metropolitan Telephone and Telegraph Company, and Cull, of the Hudson River Telephone Company, with a view to adopting the best means and most economical way of overcoming the trouble. It was decided to adjust the armature so that, in its normal position, it would be sufficiently near the magnet core to work by a subscriber's magneto, but not be operated by the railway current. This work took about ten days, and was found to clear about 95 per cent. of the trouble. The lines were again put into the new office, where they have been in operation for a month, giving perfect satisfaction. Many letters from subscribers, complimenting the company on the improved service, have been received.

The manner of connecting the power plant is original with the company's very capable electrician, Mr. W. H. Cull, (to whom the REVIEW is indebted for much of the information in this issue), and consists of a $\frac{75}{100}$ kilowatt Edison motor, two local generators, one toll line generator, one small dynamo for charging storage batteries and four cells of type 15 "I" Julien storage battery—two of these cells are emergency cells. This outfit is placed in the terminal room, on the third floor. In addition to this, an emergency power plant is located in the cellar, consisting of a No. 2 Pelton water motor and three generators.

Two cells of storage battery operate all of the switchboard transmitters and chief operator's desk transmitters—18 in number—and are so connected that every alternate transmitter is operated from each cell. The tra

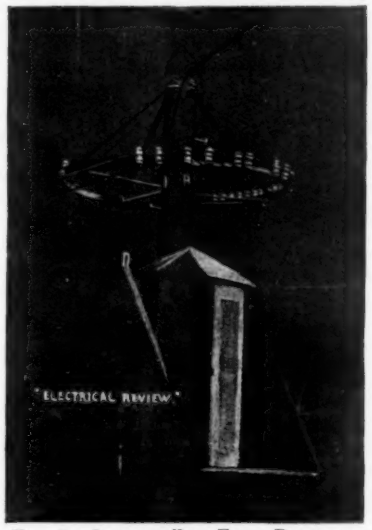


FIG. 3.—SEVENTY-FIVE FOOT DISTRIBUTING POLE.—HUDSON RIVER TELEPHONE COMPANY.

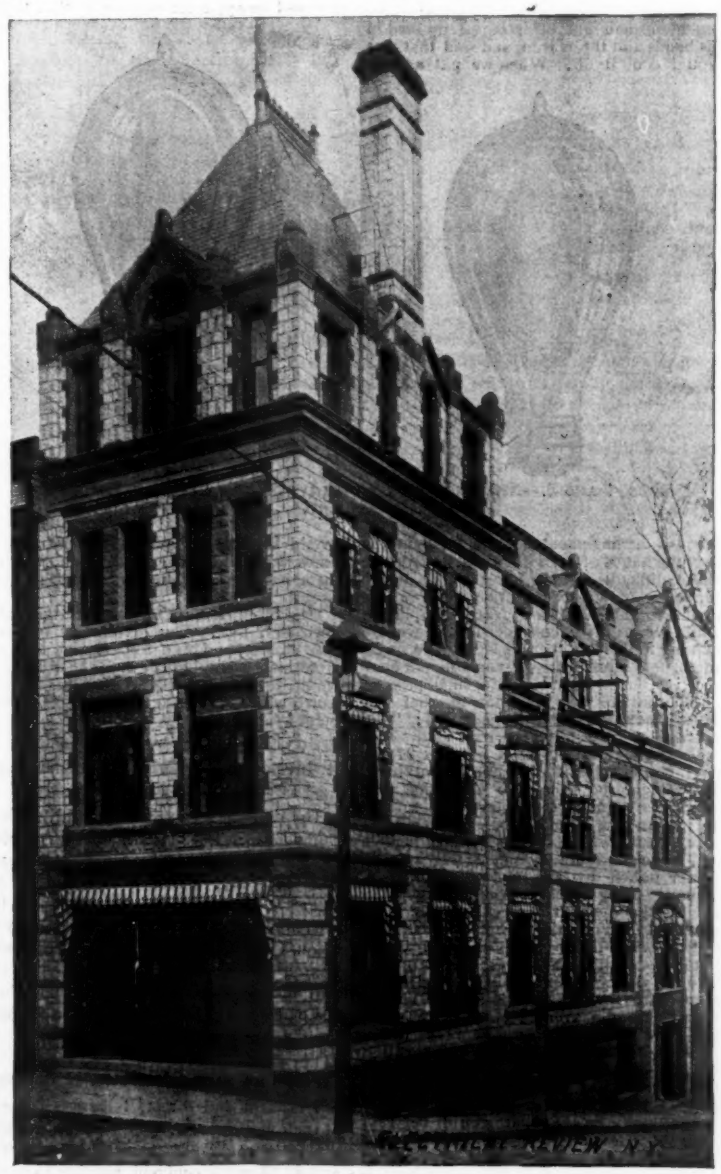


FIG. 4.—HUDSON RIVER TELEPHONE COMPANY.—NEW BUILDING AT ALBANY.

reason of this is, that if one cell becomes defective, one operator can attend to two sections for the few minutes it will take to connect in a new cell of battery. The restoring drops are operated by these same two cells, connected in series with one pole of the battery to earth. It is found that there is consumed less than four amperes per hour on the average and that the batteries never have to be charged more than four hours daily.

The switchboard is thoroughly dusted every night by a feather duster and a bellows. The manholes are inspected twice a month, and water pumped out if any is found in them. Troublesome manholes are looked after oftener if found necessary. An inspector of subways has been selected from the construction force, whose duties include keeping posted as to the opening of all streets wherein the subways are located. All ducts entering buildings are stopped up with plaster of paris. It would seem that with this system of inspection the chances of trouble are reduced to a minimum.

Mr. Henry Laurens Storke.

The ELECTRICAL REVIEW takes particular pleasure in presenting an excellent likeness of Mr. H. L. Storke, with a sketch of his active telephone career, in connection with the article on the Hudson River Telephone Company. Mr. Storke, who is one of the pioneers in telephone work, is a modest, genial gentleman who numbers friends by the many score, and whose constant good humor and faculty for seeing the bright and cheerful side of things has made him one of the most popular of men known to telephone circles. Trained in the school of journalism, upon a country newspaper, where the editorial and literary work is combined with the business management, he entered the telephone business well equipped for the pioneer work of educating the people to the uses of the then almost untried instrument. Full of faith in its possibilities, with untiring energy he pressed its claims upon a doubting public, canvassing, organizing companies, interesting capital and preparing the way for the larger future which he believed awaited this great invention.

In the spring of 1879 Mr. Storke, who had been associated in the publication of the *Daily Bulletin* and *Morning News* at Auburn, N. Y., had an opportunity to investigate the workings of the telephone, then beginning to assume a commercial value, and was tendered the position of assistant general manager of the telephone department of the Western Union and Gold and Stock Telegraph Companies.

At that time the memorable contest between the National Bell Telephone Company, of Boston, controlling the inventions of Alexander Graham Bell, and the Western Union interests, using the telephones of Edison, Gray and Phelps, was at its height. The Western Union Telegraph Company, with Dr. Norvin Green, then, as now, its president, was controlled by the Vanderbilt interests, represented by H. McK. Twombly, vice-president. Mr. Twombly took a deep interest in the telephone contest, and it was largely owing to the energy and persistence with which he carried on the fight that it resulted, in view of subsequent legal decisions, as greatly as it did to the benefit of the Western Union Company.

It was a battle of giants, terminating on November 10, 1879, in the agreement of that date, under which the Western Union Telegraph Company and associates retired from the field in consideration of a 20 per cent. interest in all rentals and royalties received during the next 17 years and the retention of certain valuable telephone properties. The aggregate of the income received from the American Bell Telephone Company during this period, and the value of the telephone interests held by it, represent, it is believed, a profit to the Western Union Company under this settlement of not less than ten millions of dollars.

During the next two years, Mr. Storke in connection with Mr. Thomas B. Doolittle, of the Bell Company, was engaged in settling up various complicated matters connected with the transfer of the telephone properties conveyed by the agreement of November 10; in the management of the Private Line Department of the Gold and Stock Telegraph Company, and in the promotion of the telephone business under licenses from the Bell Company.

He was largely interested in the Bell Telephone Company, of Missouri, and was its first treasurer.

During this time, in connection with Thomas A. Edison and others, he became interested in the telephone business in Chili and other points on the west coast of South America; a successful venture, which subsequently, under the management of Theodore N. Vail and Oscar E. Madden, grew into the West Coast Telephone Company, which was some two years ago transferred to an English syndicate.

After his retirement from the Gold and Stock Telegraph Company, Mr. Storke closed out his interest in the Bell Telephone Company, of Missouri, and from that time devoted his entire energies to the telephone business in New York State. Outside of the Buffalo and Metropolitan districts, he was prominently connected with the promotion and organization of nearly all the companies in the State. In connection with Messrs. Wm. G. Wise, Dexter A. Smith, George Underwood and James Seymour, Jr., of Auburn, N. Y., he organized the Empire State Telephone and Telegraph Company, with headquarters at Auburn, where his home is located.

The Central New York Telephone and Telegraph Company was next organized by Mr. Storke, in connection with Messrs R. S. Williams, F. G. Wood, L. G. Lawrence and C. A. Nicholson, of Utica.

He was associated with Messrs J. C. Clark, of South Framingham, Mass.; Charles F. Cutler, of New York; W. F. Eastabrook, of Elmira; Henry S. Hyde and C. A. Nichols, of Springfield, Mass., and others, in the organization of the New York and Pennsylvania Telephone and Telegraph Company, and finally in the organization of the Hudson River Telephone Company, details of which are given in full on another page.

Mr. Storke was active in the organization of the National Telephone Exchange Association, holding the position of treasurer continuously from 1884. Probably no man in the business is more widely known or more popular, and the REVIEW is pleased to present in its columns this brief sketch of one of the men so actively engaged in promoting telephone interests.

The General Electric Company's New Incandescent Lamp.

The demand for a thoroughly high class incandescent lamp, especially adapted to the lighting of street cars, or for use on power circuits, has been steadily growing during recent months. At the lamp works of the General Electric Company, a series of experiments in the direction of satisfying this demand have lately been made, with entire success. The outcome of the experiments is three special types of lamp, which satisfy the exacting requirements of railway and power work. It must be borne in mind that the special requirements of a lamp destined for use in series on railway circuits differ materially from those of the ordinary lamps which are connected in multiple on low tension circuits.

The first lamp is the straight unanchored filament lamp, differing in no way in appearance from the ordinary incandescent lamp. This lamp is rated according to the amount of current consumed, and only those consuming the same amount of current should be used in any one series. In order to avoid the possibility of errors in order or shipment of this style of lamp, a special record is kept of the lamps shipped to different companies, and thus lamps of the same current carrying capacity as those they may have received on previous orders are always sent to each company.

In the anchored filament lamp the chance of breakage of the filament by sudden contact with the glass of the bulb, caused by motion of the car, is entirely obviated. The life of the lamp is, consequently, not exposed to abrupt termination or even abbreviation.

The design of the spiral filament lamp is the most novel and most pleasing. As will be seen from the cut, the spiral filament is made in three turns, mounted on a heavy glass center, and requires no extra support.

Great care is exercised in the manufacture of the two last named lamps, in order to render the resistance exactly the same throughout each form, so that any "spiral" or "anchored" filament lamp may be used with others of similar form. Neither one, however, must be used in series with the others.

Christmas *Judge* is the finest satirical and pictorial publication of the season. Publisher Arkell and Artist Gillam may be congratulated on distancing the field this time. We would advise everyone of our readers to secure a copy of Christmas *Judge*, and then seek some quiet retreat for four hours of relaxation, recreation, instruction and artistic enjoyment.

ELECTRIC TRACTION.

DISCUSSION ON THIS TOPIC BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—CONTINUED FROM PAGE 162, NOVEMBER 29.

Mr. Charles Hewitt: The use of the shunt motor for street cars has not been entirely neglected in this country, and is certainly not original with Siemens & Halske. I am not sure but that the president has tried it in the early days, and although Siemens & Halske may be able to use their locomotive successfully in London on that particular road, it certainly will not be a success here until we get a much smoother running trolley than we have at the present time. Any one noticing a trolley running here will find that at almost every hanger there is a slight sparking. That is due to the slight contact and sometimes no contact at all, due to the jolting of the trolley from the wire. I have been on cars with a voltmeter when I could count every clip by the swing of the needle. With a shunt motor every time the trolley leaves the wire the shunt field is discharged, and when it strikes the wire again you get a short circuit through the armature. This trouble is still worse when the trolley wheel jumps off, as it frequently does at switches. I believe in London they use a third rail and a top-running trolley wheel, perhaps two of them, and are sure to get a contact all the time.

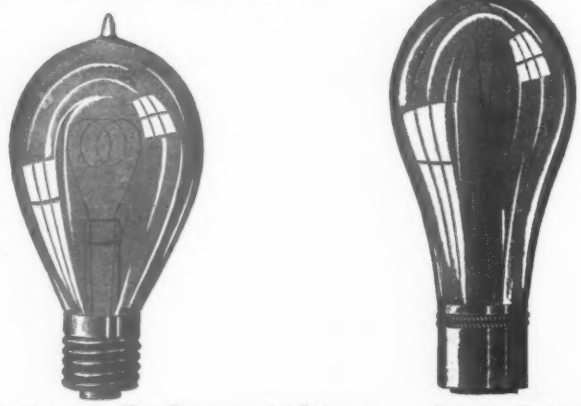
With regard to Mr. Leonard's arrangement, I do not intend to go into any details of it, except as to the complication involved. We all know the difficulty of having two motors on a car properly cared for. Only recently, within a very short distance from here, I knew of a case of a hot journal where the motorman got off, scooped up dust in his hands and threw it in, and said that that would cool it off. When we put a complicated arrangement such as this must be into the hands of men like that, we increase those difficulties very much. The whole tendency of street car practice to-day, it seems to me, is toward greater simplicity. I am very nearly convinced that we are coming to the day when we shall use a single motor on street cars—I won't say on locomotives, but on street cars—for small powers.

I want to call attention to what Dr. Hutchinson spoke of on page 585: "An average of 12 tests on the road shows that with two motors on a car it requires 27 per cent. less current if only one is working." Dr. Hutchinson seemed to think that that was chiefly due to the motor working at a very small part of its power. From a great many tests which I have made myself and have seen others make, the average power taken by the motor when it is actually doing work is somewhere in the neighborhood of 50 per cent. of its rated maximum. You take these tests that are shown here—I have not averaged them, but I have averaged a great many others. The No. 6 motor, I believe, is wound for 25 amperes. On a great many tests I have found that the average current while the motor was actually being worked varied from about 20 to 30 amperes per car, that is, the average of all the readings. Say the average for the car is 25 amperes, and assuming that each motor does its proportionate share, that would be 12½ amperes per motor, or 50 per cent. of the full load of the motor, and at 50 per cent., granting that this curve here is approximately true, the output would be 7½ horse-power. They have carried out this curve farther than we usually consider it. Say the motor is a 15 horse power motor, at half load it gives over 80 per cent. efficiency. Even if the power used is only between five and six, you see the efficiency is over 80 per cent. So that I do not think the difference between the one and two motors is due so much to the low efficiency as it is to the difficulty of making two motors run together as the motors on this road were connected. It is a well known fact now, that with two motors, connected according to Mr. Sprague's design, with a connection from one motor to the other between the fields and the armatures, it is very difficult, especially with the double reduction type, to get them to equally divide the load. This difficulty brought out the equalizing coils which were invented, I believe, by Dr. Hutchinson. The matter has been simplified more recently on the new motors by giving each motor a distinct circuit. I have known cases where not only one motor has done no work at all, and the other has done all the work, but cases where one motor has turned into a generator, and generated as high as 10 or 11 amperes, and the other done all the work. So that the difference between one motor and two motors in that case would be very apparent, and not due to the low load at which the motors were working. I have had such a case as that within a couple of weeks.

Dr. Hutchinson: Of course, I know that a great deal of the loss is due to the fact that one motor drives the other as a generator. But still, if you take the efficiency curve at the car axle, you will find a difference of about 15 per cent. But the tests given by Professor Shepardson, and just quoted, are tests on the armature shaft, not on the car axle, and consequently not applicable.

Mr. Mailloux: I would like to ask if Dr. Hutchinson has any information on motors when they are equally balanced by having each run with an independent circuit? I was astonished myself to discover that this method of running independently was not sooner brought into use, because I have never run motors in any other way but in an independent circuit for each. Of course, it would be apparent right away that there would be some difficulty. I would like to know what difference there is in running them balanced, each motor having its own circuit.

Dr. Hutchinson: You have a certain total horizontal pull. You divide this between two motors, and find the current for one motor and multiply it by 2. The difference would be about 15 per cent. It is hardly worth while going into, but you will see the point at once.



FIGS. 1 AND 2.—NEW INCANDESCENT LAMPS OF THE GENERAL ELECTRIC COMPANY.

Reduction in the Price of Incandescent Lamps.

The Beacon Vacuum Pump and Electrical Company, of Boston, announce a decided reduction in the price of incandescent lamps. This company, which is the owner of an extensive factory, states that the reason for the reduction is to be found in the ability to manufacture cheaply by means of new and improved methods. This movement on the part of the Beacon people enables their customers to receive the advantage of these improvements.

West End Street Railway, of Boston.

The West End Street Railway directors, at their meeting last week, declared regular dividends of $2 per share on the preferred and $2.50 on the common, payable to stockholders of record December 10. Books close December 10 and open December 20.

Although the West End October statement is not yet ready for publication, President Whitney says it will show net earnings of about $200,000. The gain in gross earnings for the month of November will exceed $50,000, it is stated.

ELECTRIC RAILWAYS.

MR. McTIGHE'S SECOND ARTICLE ON THE "RETURN CIRCUIT."

Various Improvements That Have Been Tried—Latest Type of Rail Bond—The Destructive Influence of the Soil—A Reliable Return Circuit System Summed Up—Cross-Bonding, Ground-Plates, Etc., Etc.

BY T. J. McTIGHE, PH. D.

(*Continued from Page 174.*)

The channel-pin (see Fig. 3) appeared, and at once filled a want—*i. e.*, a bond of variable length and great ease of application. In theory it was admirable, but its use developed the above mentioned uncertainty of result in respect of resistance of contact and liability to shake loose. Like the soldered rivet type, the channel-pin style is merely driven into a hole in the rail. There is no heading up of the protruding end, and no upsetting of the metal, within the hole. The pin cannot be made so that it, with the bond wire, will completely fill the hole in the rail. Entrance exists for moisture and corrosion soon begins. Result, high resistance contact between rail and bond-wire, rail and pin, and bond-wire and pin. The trouble is double because of two such sets of conditions for every bond. Enduring and constant contact rail bonding does not seem possible with any of the foregoing types.

Lately another type of rail bond has appeared. It consists (Fig. 4) of two cast copper rivets each having a lateral stem, united by a piece of copper wire by being electrically welded. The attempt is in the right direction, but the writer finds this bond as now made open to serious objections. The electric weld in many cases has proved defective and often the parts are united only by the slag formed by the fused flux and the oxide mingled together. This may hold unnoticed while riveting the bond into the rail, but it will soon break apart under constant vibration of the rails from traffic. To exercise a degree of care necessary to insure thoroughness of weld makes the cost excessive. Another objection is in the cast copper rivet. Such small castings are seldom free from "piping" and radial crystallization, and many of the rivets break off at the first blow.

A rail bond, designed and patented by the writer, recently brought out by the Railway Equipment Company, of Chicago, and the New York Electrical Works, of New York, has probably met the case squarely, so far as a bond-*wire* can. It is a one-piece affair (Figs. 5 and 6), and is simply a heavy Norway iron or copper wire drop-forged at its curved ends to form a swelled shoulder and rivet, the curves taking care of the rail expansion and contraction, and dissipating the shock of transmission due to the vertical motion of the rail ends when the car wheels pass the joint. This bond, being one piece of metal, can suffer no failure of contact between its ends (except by total corrosion or electrolysis), and when fairly upset in a freshly reamed rail hole and headed decently, can have no failure of rail contact by corrosion, because the joint made is both water-tight and air-tight.

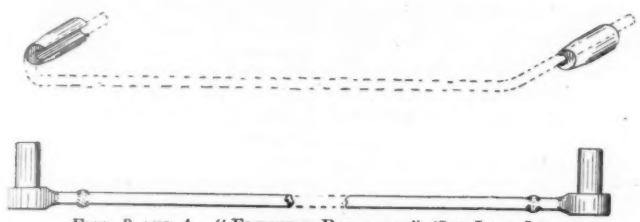
No. 7.

Destruction of the rail bonds and supplementary wire (where used) is almost inevitable, it is believed, in most soils, sooner or later. In some cases corrosion alone will destroy, and in others its action is helped by electrolysis at such points as remain moist most of the time. Some soils are slow in action upon copper, but quickly destructive of iron bonds, while others are just the reverse. Each case ought to be studied apart before deciding. In any case, an

unprotected rail bond, whether copper or iron, will, the writer believes, have to be renewed before many years, for even an almost imperceptible electrolysis will gradually eat away the substance of the bond if the latter is exposed, no matter whether iron or copper is used. But, as will be seen later in this article, there is a way out of this difficulty.

What, then, constitutes a reliable system of return circuit? It may be summed up thus:

1. A rail bond, itself mechanically good, which will at least approach a reasonable utilization of the rails as a direct return.
2. A bond of the least possible length.
3. A bond whose rail contact can be readily inspected at all times.



FIGS. 3 AND 4.—"ELECTRIC RAILWAYS." (SEE LAST ISSUE.)

4. A bond protected against electrolysis and corrosion.
5. A reasonable amount of cross-bonding from rail to rail, and from track to track.
6. A number of effective ground plates heavily connected to both rails of single track, or the four rails of double track, and buried below frost-line, or sunk in water, if possible.
7. A main return, from nearest tracks back to the power house, of such capacity that it will carry the maximum current load with but little drop of potential.

The writer has designed the construction shown in Fig. 6 for the flat-iron girder rail now mostly used.

The one-piece bond shown at Fig. 4 is undoubtedly perfect mechanically. There is nothing about it to get out of order or break loose. Instead of using a long bond to reach around the fish-plates, the same amount of metal is utilized by a very thick, short bond, which is set upwardly *through the tram* of the girder rail. An example of this construction may be seen in the tracks of the Atlantic Avenue Railroad Company, in Brooklyn, and is illustrated in Fig. 6. In this case the rails are drilled with a half-inch hole four inches back from the end. The rail bond is a piece of No. 000 A. W. G. soft copper wire drop-forged to form the shouldered ends of a half-inch diameter. Before applying the bonds, the rail holes are taper reamed from above, and deeply countersunk, giving fresh contact surfaces. A suitable supporting tool is used, and the bond upset and headed down so as to completely fill the hole and countersink.

Such a bond, being in length about one-fourth the usual length, and about four times the sectional area of the usual No. 4 wire, evidently is 16 times a better conductor than the latter. And, as compared to a No. 4 iron wire, the resistance of the latter would be about 96 times as great. The No. 000 copper bond has a sectional area of about one-eighth of a square inch, which is about equal to a bar of iron three-quarters of an inch square, not far from the conductivity of a rail weighing 10 pounds per yard, or, in double track, practically equal to a 40 pound rail. That, together with the rail splices 26 inches long, Sampson bridge joints and heavy tie-rods, gives a track circuit which is far in advance of any yet constructed.

By setting the bond rivet up through the tram of the rail two results are accomplished. First, the bond is directly protected by the overhanging tram, and in subsequent removal of pavement no harm can come to it. Second, the nature of the contact can at any time be inspected by simply sweeping the rails at the joints and examining for looseness. This is a great advantage, as it enables the track circuit to be kept in perfect condition at a nominal expense.

A reasonable amount of cross-bonding should be indulged in on every electric railway. As it is useful mainly in relieving a given section by affording the current paths through all four rails, and taking care temporarily of a broken bond at any point, the conductor used need not be very heavy. Cross-bonding may be classed as "irregular," along with that necessary to insure the continuity of rail circuit through pieces of special track-work, such as crossings, turnouts, cross-overs, etc., which are usually built up of many parts and are subject to severe usage. As these require bonds of widely varying lengths, considerable waste of metal takes place in using the standard lengths obtainable. To overcome this and produce a readily adjustable length, and to insure a thorough and lasting contact, Mr. S. W. Childs and the writer have designed the devices illustrated in Fig. 7. The rail tram is drilled, tapered and countersunk from above, as for the standard bond. A soft copper thimble, having one end shouldered, is slipped over the end of a soft copper No. 0 wire, allowing the latter to project about a quarter of an inch beyond the thimble. The latter is then inserted upwardly through the rail hole, and a support given the shoulder while hammering. A setting tool, having the shape shown, is then applied, the wire entering freely into the tool cavity, and a few vigorous blows on

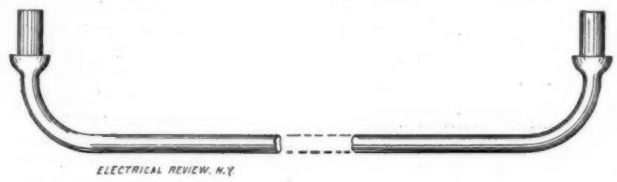


FIG. 5.

the tool accomplish several results. The flat edge beats down the edge of the thimble, causing the latter to fill the rail hole solidly, and to bind inwardly against the wire. At the same time it spreads the upper end of the thimble and makes it into a countersink. When properly done, the wire is so tight in the thimble that it cannot be turned. Then a riveting hammer is applied directly to the

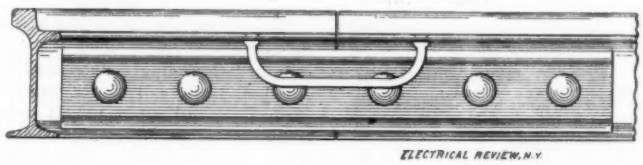


FIG. 6.

wire, and the latter headed up into the countersink. After that, the wire is cut to just the length required, and the operations are repeated at its other end. The complete application of such a bond takes less time than to tell here how to do it. The connection of bond to rail is perfectly solid and water-tight, and no corrosion will occur at that point. The device prevents the necessity of using one inch more wire than required (similarly to the "channel-pin"), and has the additional advantage of non-corrosive contacts and permanence. It is exceedingly convenient.

In applying ground plates they should be generous in surface and thickness and buried, not only well below frost line, but in a permanently moist earth. The wire connection from rails should be riveted very securely to the plate and the joint very thickly coated with tar, rosin or other protective coating. It is well, also, to follow the telegraphic practice of laying the ground plate in a good bed of charcoal, or washed coke. The latter should be of the kind known as "72-hour coke," and free from sulphur. The size of ground plates and their frequency must vary with the circumstances, and no general rule can be laid down. The main ground at the power house should be large, and either put into a constantly supplied well or buried in moist earth. In the latter case, it is prudent to carry a two inch pipe up to the surface from the ground plate. Then, in event of the moisture being insufficient, water can be supplied through the pipe to any desired amount.

(To be continued.)

The DeKalb Avenue Street Railway, of Brooklyn.

The Brooklyn City and Newtown Railroad (known as the DeKalb Avenue Line), Col. John N. Partridge, president, recently adopted the Westinghouse electric system to replace horse traction. Direct coupled generators were used. A private test of the changed line was made Tuesday evening of last week, President Partridge, Captain Candee, Superintendent Hines and a few others being present. The president of the road acted as motorneer, handling motor and switch from the station on Broadway and DeKalb avenue to the Brooklyn Bridge and back.

The trip was successfully made, without hitch or slightest delay. The speed of 10 miles an hour, the highest permitted in the city, was easily kept up. This is the first car that ever passed over the line with electricity as its motive power, and the success of the test is greatly to the credit of President Partridge and his engineer.

The plant includes Westinghouse electric generators and engines, Okonite feeders, Johnson rails, etc., and is one of the most modern and best equipped electric railways in the country. The change from horse traction will be gradually made during the next few weeks, and Brooklyn is to be congratulated on another evidence of the progressive spirit of her street railway owners.

Maryland telephone subscribers some time ago banded together to secure a legislature act reducing the price of the telephone service 30 per cent. By the recent act obtained by them, telephone charges, anywhere within the State, are reduced to the rate of $6.50 per month for single instruments, and $5.50 per month where two or more instruments are rented by one person or firm. The former charge of the company was $100 per year for an instrument.

The telephone line connecting Cobb's Island and Smith's Island with Broadwater, Va., was completed on November 30. This is a part of the life-saving station line which is being constructed along the Atlantic coast.

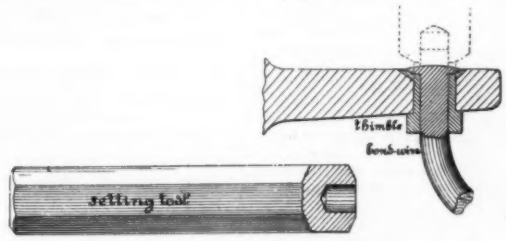


FIG. 7.

TELEPHONE CHAT.

The long distance telephone between Detroit and Port Huron is nearly completed.

The New England Telegraph and Telephone Company have put wires through the town of Leicester, Mass.

The Erie Telephone Company has at present 14,729 subscribers, and this number is being increased at the rate of 1,200 annually.

The long distance telephone line from Bangor, Me., to Dover, Mass., will be completed shortly. The completion of this line will add materially to the service in eastern Maine.

The telephone exchange was put in operation in Fernandina, Fla., and the company expects to make connections with Jacksonville. At present there are 41 telephones in use.

William K. Wagner has been appointed superintendent of the New Bedford Exchange of the Southern Massachusetts Telephone Company, to fill the vacancy caused by the death of Moses E. Hatch.

The Southwestern Telephone Company is pushing the work on the new telephone line between Dallas and Fort Worth. Superintendent Henderson states that within the next 30 days the poles will be up and the wires strung between the two cities.

The central office of Houston, Tex., was lately visited by J. P. McKinstry, general manager of the Southwestern Telegraph Company. At present there are 500 wires running into the office and improvements and additions are the order of the day.

A new trunk line to Harrisburg, Pa., taking in Lebanon, is now being built by the Pennsylvania Telephone Company, and will in a short time be put into service. Many all metallic lines have been installed, and some of them equipped with long distance instruments.

The Teche and Vermilion Telephone Line, of Louisiana, to-day completed it extension to the Central Sugar Factory of Rose Hill. This line will connect all the sugar section in Vermilion, and it is expected that it will greatly facilitate the planters in case of accidents to their mills.

The telephone has been put to good use by a kind-hearted man in San Leandro, Cal. He found an intelligent man struck by the curse of leprosy isolated in a cabin quite away from the county hospital. He put in a telephone connecting the lonely cabin with the hospital reading room, so that he shall have conversation with his kind.

The legislature of Georgia may be called upon to pass on a bill at the present session that would seriously affect Atlanta, and in fact every town in the State, if made a law. The bill proposed is one to reduce the price of the rental charged for telephones from $64 a year to $40. A man giving the name of Dalton has been in Atlanta and visited a number of telephone subscribers, stating to them that he intended engineering such a bill through the legislature. His work was not a labor of love, for he required $10 from each subscriber provided the bill is passed. If such a law were passed, he would collect from the 1,300 telephone subscribers in Atlanta $13,000, while the saving would be $18,000. The bill, if passed, could be repealed at the next session of the legislature, and the old rate restored. In that case the $13,000 paid for its passage would be a high price. The subscribers would do well to stop and think.

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CONTENTS.

	PAGE.
Views, News and Interviews	185
Press Club Election	185
An Electric Retouching Pencil	185
Hudson River Telephone Company	185
The General Electric Company's New Incandescent Lamp	188
Electric Traction	188
Reduction in the Price of Incandescent Lamps.	188
West End Street Railway, of Boston	188
Electric Railways	188
The DeKalb Avenue Street Railway, of Brooklyn	189
Telephone Chat	189
Is It a Bubble?	190
The Albany Switchboard	190
Correspondence:	
Our Chicago Letter	191
Our Boston Letter	191
An Improvised Search-Light	191
Finances of the Westinghouse Company	191
Patent Suits Said to Involve All Electric Roads.	191
The Electric Light	191
Personal	191
Letters From a Laboratory	191
Electric Light Flashes	192
St. Louis Electric Club	192
A Novel Entertainment	192
The Lundell Motors	192
Electric Launches	192
A Double Wedding	192
Telegraph Notes	193
The Telephone Ear	193
The New York-Chicago Telephone Line	193
Electric Light Engines for Steamboats	194
The Electrical Habits of Iron	194
The Hardworking and Patient Telephone Operator	194
Advance Information	195
Electric Railway and Power Notes	195
Death of Jay Gould	195
Kindred Interests	196
The Finances of the General Electric Company	196
Society of Naval Architects and Marine Engineers	196
Electrical Patents	xii
Electric Elevated Road in Liverpool	xii

INDEX OF ADVERTISERS.

COVER PAGES.

	PAGE.
American Electrical Works, insulated wire.	i
Ansonia Brass & Copper Co., wire	xx
Armington & Sims, engines	xx
Babcock & Wilcox Co., boilers	xx
Beacon Vacuum Pump Co., inc. lamps	i & ii
Brush Electric Co., apparatus	xix
Crocker-Wheeler Motor Co., motors	i
Dixon Crucible Co., belt dressing	xx
Eastern Electric Cable Co., insulated wire	xx
Eddy Electric Mfg. Co., motors	i
Hampson & Co., E. P., engines	xx
Harrisburg Foundry & Machine Works, steam engines	i
Jewell Belting Co., belts	xx
Moore, Alfred F., wire	xx
Noye Mfg. Co., John T., engines	xx
Okonite Co., insulated wire	i & xx
Otis Bros. & Co., elevators	xx
Paine & Ladd, patent attorneys	i
Perkins Electric Lamp Co., inc. lamps	i
Reed & Co., F. E., lathes	i
Roebling's Sons Co., John A., ins. wire	xx
Simplex Electrical Co., insulated wire	i
Waldo & Stout, aluminum alloys	i
Waterhouse Bros., arc lights	i
Weston Engine Co., engines	i
Wilmot & Hobbs Mfg. Co., bell gongs	xx

INSIDE PAGES.

Allis & Co., Edward P., engines	xiii
American Bell Telephone Co.	xviii
American Engine Co., engines	xii
American Fluoride Co.	xii
Baker & Co., platinum	196
Ball Engine Co., engines	xiii
Ball & Wood Co., steam engines	xi
Barnes Co., W. F. & John, tools	xiii
Barrett, John A., electrical engineer	xii
Bernstein Electric Co., electric motors	x
Bickford & Francis Belting Co., belts	xi
Bishop Gutta Percha Co., insulated wire	xii
Blaisdell & Co., tools	xiii
Brill Co., J. G., tramway cars	vi
Buckeye Engine Co., engines	xiii
Carpenter Enamel Rheostat Co., rheostats	xvii
Case Engine Co., J. T., engines	x
Central Electric Co., supplies	xviii
Century Co., dictionary	xiv
Church & Sleight, tools and supplies	viii
Clark Electric Co., arc lighting apparatus	viii
Conover Mfg. Co., condensers	xvii
Cowles Electric Smelting & Aluminum Co., aluminum	viii
Cutter, George, electrical supplies	x
Davis, Chas. H., electrical engineer	196
Day's Kerite, insulated wire	x
Detroit Electrical Works, apparatus	x
Dewey Electric Heating Co., electric heaters	xvi
Dwight Slate Machine Co., drills	viii
Electric Construction and Supply Co., arc lamps	iii
Electrical Mfg. Co., incandescent lamps	iv
Electric Secret Service Co., cut-outs	vi
Electro-Light Engraving Co., engraving	xvii
Elektron Mfg. Co., electric motor	xvii
Empire China Works, porcelain specialties	viii
Eureka Tempered Copper Co., copper specialties	xi
Faraday Carbon Co., carbons	iv
Falls Rivet & Machine Co., friction clutches	vi
Fitzgerald, S. G., patent attorney	xii
Forest City Electric Works, arc cut-out	196
Garvin Machine Co., tools	xiii
General Electric Co., inc. lamps	ix
Gleason Manufacturing Co., E. P., electrical appliances	vii
Greeley & Co., The E. S., supplies	viii & xvii
Heinze Electric Co., electrical apparatus	iv
Heisler Electric Co., electric light system	viii
Holman Electrical Co., F., reflector shades	xviii
Holmes, Booth & Haydens, insulated wire	xvi
Horn & Co., G. E., electric bells	196
Hulbert Fence & Wire Co., wire goods	xi
Interior Conduit and Insulation Co., conduits	iv
Johns Mfg. Co., H. W., vulcabeston	iv
Jones & Son, J., electrical supplies	iii
Kellogg Iron Works, steel poles	xv
Lake Co., J. H. & D., friction clutch pulleys	196
Leclanche Battery Co., batteries	xi
Lehigh Valley Creosoting Co., creosoted lumber	xi
Marshall, Wm., condensers	vi
Massachusetts Chemical Co., insullac	vi & viii
Merchant & Co., roofing plates	vi
Morrison, Geo. H., indicators	xiii
National Electric Mfg. Co., electrical apparatus	xviii
National Pipe Bending Co., feed-water heaters	xi
New England Butt Co., braiding machinery	xvi
New Jersey Lamp & Bronze Works, electric and gas fixtures	xi
New York Belting and Packing Co., rubber belts	iv
Non-Magnetic Watch Co., watches	xviii
Okonite Co., cables and wire	vii
Onondaga Dynamo Co., electrical apparatus	xvii
Ostrander & Co., W. R., supplies	196
Penn Life Co., insurance	xii
Phœnix Glass Co., glass globes	vi
Phosphor Bronze Smelting Co., castings	vi
Pope Mfg. Co., bicycles	196
Prentiss Tool & Supply Co., tools	196
Queen & Co., electrical instruments	196
Railway Equipment Co., elec. r'y supplies	vi
Rhode Island Tool Co., drop forgings	xviii
Ries Electric Specialty Co., regulating socket	xvi
Ridlon & Co., Frank, general machinery	196
Robinson & Orr, steel rails	196
Rosenbaum, Wm. A., patent attorney	xii
Royce & Marean, electrical apparatus	196
Russell & Co., steam engines	xi
Sawyer-Man Electric Co., incandescent lamps	xvi
Sessions Foundry Co., iron castings	xiii
Schuyler Electric Co., arc lighting	xvi
Shawmut Fuse Wire Co., fuse wire	xiii
Siemens & Halske Co., electrical machinery	iii
Solar Carbon & Mfg. Co., carbons	xvii
Standard Paint Co., insulating compounds	xiii
Stevens & Morris, engravings	viii
Stocking, E. B., patent attorney	xii
Swan & Lane, contractors	xii
Tyndall, Wm. D., attorney	xii
Walworth Mfg. Co., trolley poles	iii
Wanted	196
Washburn & Moen Mfg. Co., wire	xii
Watson & Stillman, hydraulic presses	xvii
Western Electric Co., supplies	xvi
Westinghouse Electric & Mfg. Co., apparatus	v
Wheeler Condenser & Eng. Co., condensers	xiii
Willson, H. B., patent attorney	xii

THE OPINION OF AN AUTHORITY:

"The editorials appearing in ELECTRICAL REVIEW have been of untold value to all electrical enterprises."

A. M. YOUNG.

Washington is to have another storage battery railroad. May it live long and prosper.

Brooklyn keeps up with the procession in giving her citizens rapid transit with a big R. It is high time for New York to fall in.

On the whole, the transmission of power by alternating currents looks highly promising in this country. Those interested in polyphase motors are hard at work, and it is said the Stanley motor for use on two-phase circuits will soon be in the commercial field.

IS IT A BUBBLE?

An attractively illuminated prospectus has appeared lately in some daily papers setting forth in glowing terms a wonderful opportunity for the small capitalist, the widow and her mite, the custodian of trust funds and the dear public generally to come forward and purchase shares at a tremendous shave below par. This time the scheme is to build and equip an electric railway several hundreds miles long, on which trains are to run at a speed of over a hundred miles per hour, between two big cities of the West. The confiding public is invited to step forward and exchange its hard earned dollars for nice crisp paper certificates, each testifying that the purchaser is entitled to so many "full paid non-assessable shares" of the Greased Lightning Railway Company in return for a payment of less than one-half the par value of the stock.

Electricity has played an important part in the matter of railway construction in recent years, but so far, even its greatest strides have been modestly confined to street railway and interurban improvements where the five-miles-per-hour jog of the toiling car horse has been quickened to the 10 or 12 mile speed of the motor-car, with occasional spurts in the suburbs at a 20 mile rate. All this has been accomplished with the aid of an army of highly skilled inventors, mechanics, engineers and improvers in all departments, and they have progressed with marvelous rapidity to the present goal. But their glory must now take notice to quit, for a comet has arisen in the West which travels at a 100 mile gait. We are informed that the common electrical engineer must now take a back seat, that he is no longer of any account, that the new wonder is based upon ideas and discoveries too unfathomably deep for his comprehension. The real *fin dé siècle* engineer has come forth and is determed to astonish the natives—and incidently to pocket their shekels.

We are not disturbed by the magnetic manifesto of the Greased Lighting Railway Company, and we venture to believe that during the harvest of the Columbian Fair the old fashioned steam roads, though many miles longer than this new air line, will be found doing their full share of business, and the man who wants to travel a 100 miles an hour will have to saddle a cyclone or harness a genuine lightning bolt.

No such road can be built for $12,000 per mile of single track, which is the amount estimated, including trolley line, feeders, road-bed, track and power plant. The grading, ties and rails would eat up a much larger amount per mile. Following out the terms of the prospectus, there would have to be 30 trains per day in each direction, consisting of two cars each during 18 hours of service, running on a headway of 10 minutes, and requiring at the generating stations a total of well up to 50,000 horse-power. The cost of such a generating plant, even if divided, would be for prime motors and generators a most serious item.

The proposed trolley wheels would have to run at a speed not less than 3,000 revolutions per minute—a speed requiring the very highest class of mechanical construction and balancing, and in our opinion not practicable. In present electric railway construction, with an average of 15 amperes of current, there is constant sparking and heavy wear and tear at the suspension points or hangers of the trolley wire, though the speed seldom exceeds 15 miles per hour. Now, multiply the number of hangers in the way proposed and increase the speed nearly seven times, and the practical difficulties begin to array themselves in a solid phalanx which even this Western sky-scraper cannot surmount.

Furthermore, this latest wonder of the West is promised to operate on the alternating current principle, with step-up and step-down transformers. The transformers are not *per se* a difficulty. Alternating current motors are not an impracticable obstacle, especially when we consider the success already attained with the polyphase principle, and the use of a proportionate number of conductors. But when we are told that the new enterprise is to be based on alternating currents, and that only one wire is to be used, and we consider that our ablest inventors have as yet not been able to solve the much studied problem involved, we are compelled to call a halt on our credulity.

But then, perhaps, the Greased Lightning Railway Company has enlisted a conqueror of this daily Waterloo of our best inventive minds; perhaps it has in true western style boldly lassoed the occult forces of alternating current transmission; perhaps it has in similar western fashion cornered the market on the whole range of alternating electric currents. But again, perhaps it has not. Prominent American and foreign electrical engineers are alleged to have given the scheme the most searching scrutiny, but the allegation fails to give the result of their scrutiny. So far we have failed to find a single electrical engineer who will venture to endorse the statements made in the prospectus.

We ourselves do not wish to lightly condemn any reasonable project in which electricity plays a part, but we believe in learning to walk before attempting to run, and in learning to run well before trying to break records in sprinting. Between the known practicability of 20 miles per hour with direct current, and 100 miles per hour with doubly-transformed single phase alternating current, there is a gulf of experiment which will require the unremitting toil of the best intellects available in the art.

Undoubtedly brilliant results in interurban railways and many more enterprises lie in the future of electrical engineering, but we do not believe the Greased Lightning Railway will be running as per prospectus in 1893.

THE ALBANY SWITCHBOARD.

The successful operation of the Albany switchboard which we record this week marks an epoch in the development of telephonic apparatus in this country. This is the first magneto switchboard as far as we know which has no normal contacts. It is constructed entirely on the "bridging" plan, both the drops and the spring connections being connected in multiple arc. The fact that the line drops are never cut out of circuit requires that they should be of high impedance and equipped with locking devices to prevent them being thrown by a calling operator. The locking apparatus is utilized to operate a self-restoring mechanism which relieves the operator of the trouble of putting up the drops. The Albany board possesses many other excellent features, such as perfectly balanced circuits and freedom from false "busy tests," which have excited the keenest interest among telephonists who are eagerly watching every development of the Albany trial. We have no doubt of the continued success of the new type of switchboard and predict for it a large and successful inning.

It is unfortunate that electricity has been put to such a use as in a case which occurred recently at an Indiana race track. A jockey had concealed in his blouse an induction coil, similar to one used in medical batteries, and the terminals of the secondary coil were attached to his spurs. The horse that this jockey had to mount was known by him to be outclassed, and in order to infuse new life, he used this shocking means to accomplish the end. The poor brute was jabbed in the flanks by the vicious jockey, who increased the current as he neared the finish. Each time the spurs met the horse's flanks, the poor animal was noticed to act as if he were in great pain. Naturally, the judges observed these actions and inquiries were set afoot which resulted in the jockey's being ruled off the track for barbarous conduct. We are glad that immediate notice was taken of this misuse of electricity and that summary punishment was meted out to the perpetrator of this outrage.

CORRESPONDENCE.

OUR CHICAGO LETTER.

George Cutter reports large orders for the china switches and cut-outs which he is now handling for Pass & Seymour.

Telegraphic Advices state that the electric light plant of the Des Moines Water Power Company was destroyed by fire last night.

The **Enterprise Electric Company,** lately at 315 Dearborn street, has moved to 307 Dearborn street. Their new quarters are much larger and afford better opportunity for handling their business, which is growing rapidly.

The **Central Electric Company** report business still continuing good, and that they are having a big call for the Jones dust-proof contact bell, for which they are general western agents.

The **Southern Electrical Supply Company,** St. Louis, Mo., which is a branch of the Central Electric Company, of this city, has been obliged to move into larger quarters on account of increased business, and are now located at 11 North Seventh street, St. Louis, Mo.

The **General Electric Company** announces that it has made arrangements to handle the railway line material manufactured by the Lord Machine Works, and that all communications on this subject should hereafter be addressed to the General Electric Company.

W. R. Mason, manager of the Railway Equipment Company, reports a big trade in railway supplies during the past week. This company is also doing a fine business in the electric heating line. Among the shipments this week was 25 electric stoves, and they now hold orders for over 300 electric car heaters.

Prof. DeLand Addressed the last meeting of the Chicago Electrical Association on the subject of "Water, Light and Power at the World's Fair." His paper was full of that class of accurate information which is not too generally published, and he showed how much thorough engineering work is coming into play for this temporary installation. The topic of discussion at the next meeting, December 13, is "Three-way Incandescent Switches and their Uses.

A Visit to the Works of the Edward P. Allis Company, Milwaukee, Wis., is all that is necessary to convince one of the vast amount of business done by this company. Although they now have an enormous plant, they find their capacity for turning out engines much too small to supply the demand, owing to increase of business. In order to overcome their difficulty, they are now working on the foundation for a new building 300x100 feet, four stories, entirely of brick, which will be equipped with two Shaw electric cranes and the latest improved machinery to the value of $110,000, which, when completed, will give them an increase in their engine capacity of 75 per cent. This company is also putting in a new light and power station to supply the new addition. When the buildings mentioned are finished, this company will have, without doubt, the largest and most complete stationary engine factory in this country. M. J. B.

Chicago, Dec. 8.

OUR BOSTON LETTER.

The **Consolidated Electric Manufacturing Company** are meeting with great success with their "Lyon" brake handle, which is steadily growing in popularity.

Several Prominent Boston Firms in the electrical field are changing their quarters during the present month in order to obtain more room and better facilities for handling their increasing business.

The **Mechanics' Fair** closed on Saturday last after a successful run of six weeks. The electrical interests were well represented and indeed formed one of the most interesting features of the entire exhibit.

The **New England Telephone Company** have just completed the work of laying a large portion of their lines running through the suburb of Brookline in underground conduits, and similar methods will be adopted throughout their system wherever practicable.

The **W. S. Hill Electric Company** are greatly rushed at present with orders for their new magnetic machine, which has just been put on the market. The proprietors of *Youth's Companion* have taken them in hand and are sending in orders for large quantities.

It is Reported on good authority that the Thomson-Houston Company has purchased a patent on the storage battery system from a Peabody inventor, paying the sum of $60,000 for the secret. The company has for a long time been experimenting in that field without much success. The directors will not deny or confirm the report.

Boston, Mass., Dec. 8. H. G. T.

An Improvised Search-Light.

A LIGHT COMEDY IN ONE ACT.

Scene: Brooklyn. Stage effects: One trolley car, a few stores as a back-ground, vacant lots in the distance, and not a light to be seen except that in the car. *Dramatis personæ:* One motor man, one conductor, one belated passenger and one spectator. Time: 12 o'clock at night and weather miserable; overhead bad, underfoot worse.

This was all that was requisite for a comedy lately improvised in Brooklyn.

The car proceeds buzzing on its busy way. The belated passenger opens first one eye and then the other, and finally sleepily looks out and sees that the car has just passed his street. Every moment takes him so much farther from his home. Slowly it dawns upon him that he must get out of the car. Quickly, and suddenly, as if actuated by emotional insanity, the belated passenger makes for the door, behind which the conductor is counting his receipts for the day, and has them in the palm of one hand. Roughly the B. P. brushes past the conductor, and by so doing knocks the contents of his open palm into the street. Imprecations, maledictions, execrations on both sides, and the conductor asks spectator for matches. Spectator, who has a thinking part, signifies in the negative. Suddenly a bright idea striked the mind of the conductor, who whispers a few words to the motorman. The motorman seizes hold of the rope attached to the trolley wheel and pulls it down about a quarter of an inch, and a brilliant arc light thus formed sheds its "effulgent rays" on the surrounding scene. The conductor proceeds to pick up the quarters, dimes and nickels half buried in the slush. A contented look is seen on the face of the conductor, who gets on the platform, signals the motorman and the car proceeds merrily on its way.

Finances of the Westinghouse Company.

[From Boston *News Bureau.*]

The Westinghouse Electric Company will shortly establish a local transfer agency with the New England Trust Company. The Boston Safe Deposit and Trust Company will act as registrars of the stock. Wall street says the talk in well informed circles is that the Westinghouse Electric Company is earning 12 per cent. on the common and preferred stock.

Patent Suits Said to Involve All Electric Roads.

Two suits were brought in Toledo, Ohio, Saturday last involving, it is alleged, every electric street railway in the United States. The suits were filed in the United States Circuit Court by the Hon. Frank H. Hurd and O. S. Brumback, attorneys, representing Benson Bidwell, of Rochester, Ind., against the Toledo Consolidated Street Railway. It is alleged that this company has infringed Bidwell's "fundamental original patents for running electric cars and the principle involved in the use of under-side spring contact;" also "that the patents for the running and lighting of cars with the same current of electricity and the lighting of streets and houses along the line from the current which propels the cars have been infringed upon." This is to be a test suit, and if the plaintiff is successful some 500 different roads throughout the United States, alleged by Mr. Bidwell as having infringed upon his father's patent rights, will come in for their share of the trouble.

C. J. Jonasson, a Swede, the inventor of a device for utilizing windmills as a means of generating electricity, has formed a company for exploiting his invention. The company has bought five and a half acres of land, at Blaisdell, N. Y., and has broken ground for a factory to employ 150 hands and which will turn out 35 mills a day. Mr. Jonasson has applied for both inside and outside space at the World's Fair, and he will erect on the grounds a number of mills. The feature of the machine is the regulating device, which enables the mill to maintain a regular speed.

The Electric Light.

MARY M. SCOTT.

[From *Judge.*]

The moon was low, my hopes were high,
As on the corner balcony
I lingered for a last good-bye.

The darkness helped my eager speech.
I strove her little hand to reach;
I drew her close—when lo! blick-blick!
Ze-witt-tt! chu-chu! clack-clack! click-click!
And, bursting through the tender night,
Glared out that durned electric light.

PERSONAL.

Col. George L. Beetle, of the Western Electric Company, Chicago, who seems to have discovered the fountain of perennial youth, was a welcome New York visitor last week.

Mr. Edward Parkinson Roberts, the well known electrician of the Swan Lamp Manufacturing Company, of Cleveland, Ohio, paid the ELECTRICAL REVIEW a very pleasant visit last week.

Mr. W. W. Nichols, superintendent of the Chicago Telephone Company, has resigned his position to take a needed rest. He is going to Europe, and will probably resume his old position on his return.

Mr. H. L. Van Zile, a graduate of Rensselaer Polytechnic Institute, has invented a new system of traction for railways operating on steep grades. It is especially adapted for electrical railways. By its means a 30 per cent. grade is very readily ascended.

Mr. G. W. Gest, a New York electrical expert and contractor is at Springfield, Ohio, investigating the most practical route for an electric line from Cincinnati to that city, passing through Dayton and other towns *en route.* He is backed by a number of New York capitalists.

Mr. Charles E. Dustin, the wide-awake head and front of the Schuyler Electric Company, of Middletown, Conn., was a visitor in New York last week. In addition to looking after the affairs of this very successful manufacturing company, Mr. Dustin is interested in several local lighting companies, and is president of a large land and irrigation company that promises to greatly enrich him.

Mr. William S. Hine, widely and popularly known in electrical circles, has accepted the responsible position of general sales manager of the J. T. Case Engine Company, of New Britain, Conn., and will devote his energies and abilities hereafter to this work. Mr. Hine is a graduate of Yale, and an experienced electrician and engineer, an accomplished and talented musician, and, a few months ago, contemplated entering on a professional career in opera, but subsequently changed his mind, greatly to the regret of his musical associates who were confident of his great success. Mr. Hine is particularly pleased with his present work, represents a company that manufactures a splendid engine, and will undoubtedly score a big record in the engine field during the coming year. Messrs. Pierce & Thomas, well-known manufacturers' agents, will handle the Case engine in New York and vicinity, Mr. Hine making his headquarters at New Britain and "in the saddle."

Two thieves have been captured who performed the unique feat of stealing a mile of telephone wire. They stripped it from the poles running along the aqueduct in Yonkers, N. Y. Officers traced the stolen wire to a junk shop where 500 pounds was recovered. The men attached a hatchet to a long pole, and with the spring of the pole chopped the wire off close to the insulators.

The Chesapeake and Potomac Telephone Company, of Baltimore, received the returns of the election one hour ahead of the telegraph in Baltimore and vicinity. The police and Democratic headquarters and the Merchants' and Maryland Clubs received the returns also one hour ahead of the telegraph. They were equipped with long distance instruments.

LETTERS FROM A LABORATORY.—XXIV.

BY JULIAN A. MOSES.

It sometimes happens that a piece of apparatus has been fractured and it is so constructed that it would be impossible to heat it for soldering and thus repair the damage. When this is the case, recourse may be had to what is known as galvanic soldering. This process consists in clamping the object in such a position that it is held immovable, and attaching it to the negative pole in a copper-plating solution, using a large copper plate as the anode. Suppose the object to be thus soldered to be a part of some delicate piece of apparatus, and that it is essential that the joint should be as firm and resisting as any other part of the instrument, the following would be the manner of procedure in order to obtain the desired end: Divest the fractured part of all screws, pins, etc., that can be conveniently removed and coat it with a thin varnish. Either ordinary shellac, copal or gutta percha varnish may be used, the object being merely to prevent the deposition where it is not wanted. The pieces should now be held in place, so that the deposition may go on quietly, avoiding any disturbing element that may tend to disarrange the relative location of the fractured parts. The best clamp is the one recommended for use in soldering small pieces, which consists of a jacket made of plaster of paris. This holds the parts without any pressure, and, if the outside of the plaster is given a coat of the same varnish, disintegration of the plaster while it is in the bath need not be feared. Lay the parts in the plaster just before setting begins. Do not put them so near together that they touch, but preferably allow a little space to intervene. When the plaster has entirely set, cut away a portion immediately adjacent to the fracture, so that the liquid may be permitted to surround it and allow of a satisfactory deposition. Suspend the whole in the copper sulphate solution and send a weak current through until the gap between the two pieces is seen to be completely filled.

Where it is desired to fasten a glass plate to a frame of metal, a very satisfactory result may be obtained as follows: Fit the glass in the frame, and temporarily fasten it in place with a little wax or gutta percha, being careful to fill up all interstices with some material such as gutta percha or putty. Carefully paint a border about one-quarter of an inch wide, of thin gutta percha varnish, and extend it so that it laps over a little on the frame. When this varnish is almost dry, brush over powdered plumbago so to as provide a surface that will conduct electricity. Varnish all parts of the frame that are not destined to be covered by the copper, immerse in the plating bath, and connect with the negative pole. By using a current of high amperage and low electromotive force, a close, even deposit may be obtained which will adapt itself perfectly to all irregularities in the glass or frame, thus insuring a perfect fit. The glass will be held tightly in position, and it will be impossible to remove it without breaking it or tearing off the copper strip. It is best not to have too strong a current, for, if such is used, the deposit is liable to be granular. A dynamo giving 1,500 amperes and five volts has been found excellent for generating electricity for this kind of electrotyping, but a weaker current may be employed. In case too strong a current is used, it is possible that a brown substance (somewhat similar to the coating so often observed in gold plating) may cover the object. Many unsuccessful attempts have been made to remove this, but it was found that by immersing the articles in a mixture of nitric and sulphuric acids for a moment, this discoloration would immediately disappear. However, this deposit is not likely to give much trouble.

Some years ago a certain manufacturer of microscopes was desirous of producing an instrument equal in working capacity and smoothness of the "coarse adjustment" to one manufactured in Europe by a well-known maker. In this adjustment was a rack whose teeth were cut at an angle with the axis of the tube of the microscope. It was an essential feature of the mechanism that the teeth should be cut in this direction. It would have required many experiments to obtain this angle had we not possessed the model. There were no inexpensive machines manufactured at that time for making these racks, so the following expedient was resorted to in order to overcome the difficulty: An impression of the teeth of the rack was taken in wax, and this impression was electrotyped. The result was a reproduction of the model in tough, pure copper, which afterward proved to be a most excellent material to make the racks of. This process was continued by the manufacturer until increased profits enabled him to invest in a machine by means of which he could increase the output of racks in his factory.

ELECTRIC LIGHT FLASHES.

Coatesville, Pa., will have a plant of 33 arc lamps.

The city of San Bernardino, Cal., will soon be lighted by electricity. The San Antonio Electric Light Company will furnish the power.

The local electric light company of Duluth, Minn., has just placed in operation 26 additional arc lights along the principal thoroughfare of the city.

The Boston Electric Light Company has purchased a lot containing 44,700 square feet, lying on the northwest side of Boston street, near Ellery street, and south of the latter, in Dorchester.

The new electric light plant constructed by the Pennsylvania Railroad in Pittsburgh, Pa., opposite the Union Station, is about ready for use. The plant is a most complete one. The necessary wiring along the district to be supplied is nearly finished.

Those citizens of Ridgwood, N. J., interested in procuring an electric light plant for that town have received pledges for $7,550 worth of the required $10,000 stock. It is evident that they are very anxious to keep up with the latest improvements of the day.

The annual report of the superintendent of the Jamestown, N. Y., municipal electric light plant, shows that the cost of lighting the city has been only $3.06 a month for each arc lamp. This includes the cost of all repairs and various improvements made during the year, insurance, etc.

The Schenectady General Electric Company will soon begin the erection of another large building, which is to be used as a tube works to replace the one burned last summer. Bids have been advertised for and the contracts will be let in a short time. It is expected that this addition will give employment to 100 more hands.

A novelty in canes is one which contains a battery that supplies current for a small incandescent lamp inserted in the head. Whenever it is desired to use the lamp a cap covering the lamp is removed and the cane inclined in such a manner that the contained solution comes in contact with the plates of the battery. A current is thus obtained which will maintain the light for a couple of hours.

More than 200 members of the Electrical Wiremen's Union were able to resume work by reason of the fact that the strike, which has lasted nearly two months, was adjusted last week. The agreement stipulates that wages and hours are to remain undisturbed until April, 1893. The employers may engage men without inquiring whether or not they are union men. A non-union workman can, however, be made to join the union on the application of a walking delegate to the Electrical Wiremen's Union.

An excellent means of facilitating the labors of workmen who are mainly employed in ascending high lamp pillars has been provided in a newly invented electric pillar ladder. By a turn of a key at the base of the pillar, a rod or chain is raised which causes steps to project on both sides of the pillar. These form a safe and strong ladder, and they can be withdrawn within the pillar, when no longer required, by a turn of the key in a reverse direction. Only those in possession of the key can manipulate the steps, thus all danger from tampering by malicious persons is obviated. The steps are so weighted that they will remain either in the closed or open position.

It is understood that the insurance companies are to bring suit jointly against the electric light company of Middletown, Conn., and a wiring company, to recover damages for the recent destruction of the opera house in that town. It appears that there was no means of shutting off the current from the building, the wiring was not completed and nobody was on hand to look after it. The Middlesex Mutual Fire Insurance Company owned the building and united with the other insurance companies in prosecuting the claim. It seems that the company declares that, as railroads are held liable for fires caused by sparks from their locomotives, there seems no equitable reason why electric light companies or people who do wiring should not be held responsible for losses caused by them through negligence or otherwise. It will be remembered that this matter is also being tested in Louisville, Ky.

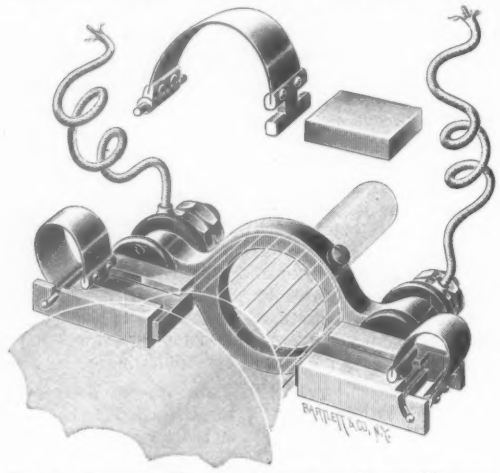


FIG. 2.—LUNDELL MOTOR.—DETAILS OF BRUSH HOLDER.

St. Louis Electric Club.

The St. Louis Electric Club has been organized under the State corporation law and the following officers have been elected:

Robert McCulloch, president; Prof. F. E. Nipher, vice-president; J. A. J. Shultz, treasurer. These three gentlemen, with the following 12, constitute the board of managers: Louis Nahm, W. L. B. G. Allen, James I. Ayer, H. A. Wagner, George F. Durant, E. V. Matlock, C. H. Turner, E. D. Meyer, James H. Rhotenhamel, E. J. Bagnel, W. H. Bryan and C. R. Scudder. The secretary will be appointed by the board of managers.

The club will hold its next meeting at the Mercantile Club on the second Friday in December, when a course dinner will be enjoyed. It is the intention to make the St. Louis Electric Club a "down-town" club, located conveniently for serving luncheon at noon, as well as dinner. In this way it is hoped to popularize the club and thus assure its success.

If atmospheric advertising is a success it is expected that the time is not far distant when we will see signs like the following:

NOTICE.

Any person who is caught projecting advertisements, billposters, etc., on my clouds will be prosecuted to the fullest extent of the law.

St. Louis Street Railway Stocks.

There is one class of industrial securities which St. Louis has always kept at home, and for which there is now developing an increased demand. They have never been offered in the East, for the reason that there is a sufficient home demand, and for the reason, too, that, being held here, they can be turned over very easily on short notice. These are the stocks and bonds of the street railway companies. The change to rapid transit has induced such an increase of transportation and earnings that the public is turning to them for investment in preference to many other commercial and industrial securities. There are very few of the stocks to be had, however, and a limited supply of the bonds of several of the companies.

The stocks to be had may be confined to occasional offerings of Lindell at 78 to 80, and of the new, or double, issue of St. Louis at 150. The railway bonds are all six per cents., except those of the Lindell, which are 5s. The Union Depot and Mound Citys are favorites at 105 and interest, and the Bellefontaines at 102½. These comprise those most frequently traded in, and which are attracting the increased attention. There are a few Peoples to be had at par, and a few Lindells at 99 to 100, while an occasional bond of the Citizens' at 106 to 107. These latter are very closely held by the members of the Chicago syndicate and their friends.—*St. Louis Globe-Democrat*, December 1st.

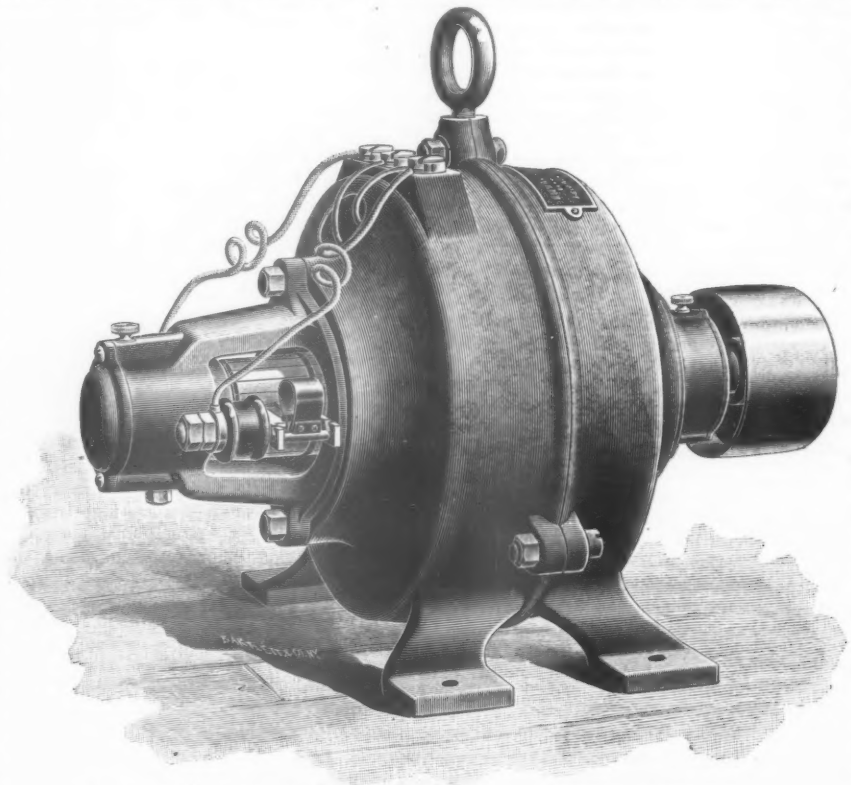


FIG. 1.—LUNDELL ELECTRIC MOTOR. MANUFACTURED BY INTERIOR CONDUIT AND INSULATION CO., N. Y.

The Lundell Motors.

The Lundell fan motors, recently placed on the market, have met with such success that the manufacturers, the Interior Conduit & Insulation Company, has felt satisfied that in introducing its new motors equal success would be guaranteed. The company claims for them high efficiency, simplicity, compactness, light weight, cleanliness and neatness of appearance. They have just brought out a full line of motors, varying from one quarter horse-power to five horse-power. In these larger sizes it has been possible, owing to the increased dimensions, to permit of placing the field coils concentric with the armature, instead of at an oblique angle. The concentric position of the field coil permits the withdrawal of the armature without disturbing either the field coil or the pole pieces; a great advantage in motors of any considerable power. A further modification is obtained in placing the commutator outside of the field magnet shell, but well protected between the two limbs of a broad and strong bracket. This change of commutator position is made for the purpose of affording the ready access to brushes and commutator demanded by motors employing a current of any considerable quantity.

Both the simple brush-holder and the armature are admirable types of simplicity and thorough workmanship.

The bearings are provided with a vision gauge by means of which a glance will suffice to indicate the necessity of a renewal of the oil supply. A number of illustrations of the motor is presented. The neat resistance box furnished by the company is shown in one of the figures.

Electric Launches.

The electric launch "Electra," the successful competitor in the trial tests made at Chicago during the past summer on the lagoons at the World's Fair Grounds, was found to be best suited to fulfill all the requirements of passenger traffic on the waterways of the Fair Grounds, and, as a consequence, 50 will now be built, at once, 25 by the Detroit Boat Works, and 25 by the Racine Hardware Manufacturing Company, after the design of the "Electra." Her principal dimensions are: Length over all, 34 feet, and beam, six feet. She carries 78 storage cells, each of 125 ampere hours capacity, developing a total energy of 2,250 watt hours. The propeller shaft is of rolled Tobin bronze. During the trial she made a continuous run of ten miles, carrying a load of 25 people. The speed on the lagoons was limited to six miles an hour, and for a short distance she made from nine to eleven miles an hour. The motor and other electrical devices were designed by the Electric Launch & Navigation Company, and the hull, propeller, etc., by Gardner & Mosher.

A Double Wedding.

Mr. Richard Castle Kempster and Miss Louise Elizabeth Kempster, son and daughter of Mr. James Kempster, of 153 West Ninety-fifth street, New York, were married Tuesday evening, November 29, to Miss Mabel Heath and Mr. Theodore Wallace Matthews, respectively. The double wedding occurred at the Mount Morris Baptist church, Fifth avenue and One hundred and twenty-seventh street, and was witnessed by a large number of friends, who afterwards repaired to the residence of the parents on Ninety fifth street and enjoyed a delightful reception from 8 to 10 o'clock.

Mr. Kempster is proprietor of one of the best-known printing establishments in New York city, and is just now engaged in explaining to his thousands of friends why so young a looking man as he is should have a marriageable son and daughter.

TELEGRAPH NOTES.

Those telegraph and telephone companies who are reported as not complying with the city ordinances, can hardly be called "wire pullers."

The Postal Telegraph Company has petitioned the Council of Montgomery, Ala., to be allowed to construct and maintain a telegraph line through the streets.

Judge Rising, of Denver, Colo., recently

FIG. 3.—LUNDELL REGULATING AND STARTING BOX.

ordered an injunction to issue, restraining the Union Pacific Railway Company from interfering with the Postal Telegraph Cable Company.

The Western Union Telegraph Company has made a contract with the Yankton & Norfolk Railway, of South Dakota, by which the telegraph company secures the privilege of constructing a line along the road.

Hon. Cecil Rhodes, premier of Cape Colony, South Africa, speaking of the annual meeting of the South African Company at London, said that he intended to construct a telegraph line from South Africa to Egypt by way of Uganda.

A recent fire in Lynchburg, Va., was the occasion of putting the Western Union Telegraph Company to a great deal of trouble by destruction of lines. The damage was repaired in a very short time. The loss will probably reach $1,000.

The wages of the telegraphers in the employ of the B. & O. road were adjusted at the meeting of the telegraphers' committee, and the B. & O. officials. About 80 per cent. of the 400 operators will secure advances of from $2.50 to $15 per month.

A rural district in Michigan has a telegraph line eight miles long, connecting a number of scattered farms with the village store, the proprietor of which officiates as telegraph operator, express agent, etc. The total cash expenditure for the outfit was about $200, and the expense of maintenance, which is but trifling, is assessed equally among the owners.

The Postal Telegraph Company has now 3,000 offices and 125,000 miles of lines exclusive of its last purchase, the Commercial Telegraph Company, which operates principally in the New England states. It now reaches all the principal points of the country. The rumor was that the Western Union was about to purchase the Postal, but this is denied by its president.

In Pittsburgh the underground wire ordinances were made laws. There are two ordinances. One requires the telegraph, telephone and electric light wires underground west of Grant street within four years from Nov. 15, 1892, 25 per cent. of the work to be done each year. The other is a general order prescribing how the work shall be done, requiring all companies which may hereafter come in, to put their wires underground, and providing regulations for the maintenance of the system.

The telegraph operators on the lines of the Big Four are anxiously awaiting the ultimatum of General Superintendent Peck concerning the demands made by them on November 1. It is expected that Superintendent Peck will hold a conference with his division assistants and determine upon a course of action. About 65 per cent. of the operators are members of the Railway Telegraphers' Union, and should the company fail to comply with their demands a strike is likely to result. If a strike is declared it is said the engineers and conductors will co-operate.

It seems that the council of Monongahela City and the electric light company of the town are at logger-heads, and are trying each others strength in the courts. The council is having certain of the streets paved with fire brick, and it was found necessary to move the poles. The judge before whom the case was tried ruled that the decision of council in a matter of this kind cannot be set at naught by a private corporation. He also said that giving a corporation the right to enter on and use the streets of a town does not mean that the corporations can use the streets in a manner detrimental to the interests of the public, and therefore he decreed that the poles must be removed to the location fixed for them by council.

Telegraphers from Philadelphia, Reading, Harrisburg, and other cities, attended a telegraphers' contest, held in Schuylkill Haven. Some 20 operators competed. Each contestant was allowed to transmit words for five minutes, the party sending the highest number of words to receive a gold medal and the second a silver medal. Each contestant sat down to the instrument on the stage and sent type-written matter of the life of Thomas A. Edison. The average of the first seven contestants was about 190 words for the five minutes. The winner of the contest was Geo. C. Williams, of Reading, of the Philadelphia and Reading Company, and he received the gold medal, having transmitted 249 words in five minutes. J. G. Hoag came next with 245 words, and carried off the silver medal.

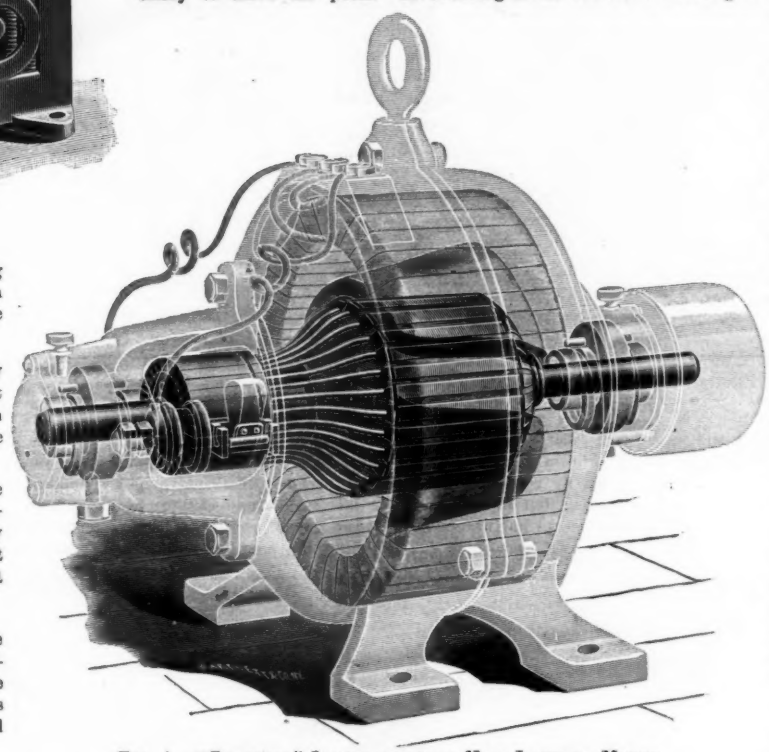


FIG. 4.—"PHANTOM" ILLUSTRATION OF NEW LUNDELL MOTOR.

The Telephone Ear.

"The other day," said a well-known doctor, "a young woman called on me at my office, and said, 'Doctor, I don't know what is the matter with my ear. I am getting deaf in the left ear.' I inquired into the case, and found that the young woman had been troubled only about six months. I applied the usual instruments, and found the inner ear perfectly normal. Upon further inquiry, the true facts of the case were revealed. The young woman was troubled with what is known as 'telephone ear.'"

The "telephone ear" is the result of the never-ending use of one ear in listening at the telephone. The doctor advises all young people, and old ones, too, who are afflicted this way, to vary the ears in listening at the receiver. If they do not, sooner or later the hearing of the ear that is worked too much will become seriously impaired.

Fire destroyed the Des Moines Water Power Company's electric plant on November 30, causing a loss of probably $50,000. The building was full of valuable electric machinery, which is practically a total loss. A large portion of the city and many private residences and business houses were lighted by the company, and all such are left in darkness. The company is incorporated for $200,000, and the plant will probably be rebuilt immediately. The plant was partially insured. The origin of the fire is unknown.

The New York-Chicago Telephone Line.

[London *Electrical Review.*]

The opening of this line, which took place on October 18, may be regarded as the successful result of a bold experiment. The actual length of the line is stated to be 950 miles. The wires, of which there are two,

FIG. 5.—ARMATURE OF LUNDELL MOTOR.

erected on the twist principle, weigh 435 pounds to the mile and are erected on 35 feet poles, there being 45 poles to the mile. Taking the resistance per mile to be 2.1 ohms and the capacity .0156 microfarad, this makes the K R of the line to be $.0156 \times 950 \times 2.1 \times 950 = 29{,}500$ approximately.

The result, therefore, once more proves the incorrectness (at least, as regards a metallic loop with the wires running in close proximity to each other), of the supposed limit of practicable speech, which, on an ærial line, has been set down at 10,000. The latter value is doubtless correct in cases where K and R are the only limiting elements; indeed, experiments on artificial lines prove this, but in actual looped telegraph lines other elements, such as mutual induction between the wires, step in and materially modify the simple K R law.

The cost of the new line, says the New York ELECTRICAL REVIEW, has been something enormous. The wire alone, at 15 cents a pound, for 826,500 pounds, would cost $123,975; to this we must add the cost of 42,750 cedar and chestnut poles, wages and service, which would make the cost of the entire circuit amount to about $380,000, roughly estimated. This line must be kept in constant repair, and the running expenses are not to be overlooked, so that the cost of five minutes' conversation, which has been fixed at $9, must not be regarded as excessive, for it must be remembered that while the person is conversing he practically has the loan of $380,000 for five minutes, and that an answer may be obtained immediately to each question.

With reference to the K R question, the following from the ELECTRICAL REVIEW seems to indicate that our American friends have even yet not grasped the fact that the K R of a metallic loop is the same as that of a single wire worked with earth at the ends, and not that of the whole loop treated as if it were a single wire of the length of the loop. "The conductor is a No. 8 B. W. G. copper wire, about 97 per cent. purity, weighing 435 pounds to the mile, supported on 30-foot poles. Its resistance is 2.1 ohms to the mile, or about 4,000 ohms for the line. The capacity at .0156 microfarad per mile would be for the line 29.64, making K R (capacity multiplied by resistance) 118,560, many times a multiple of the calculated limit (10,000) already referred to." In other words, the true K R has been multiplied by four.

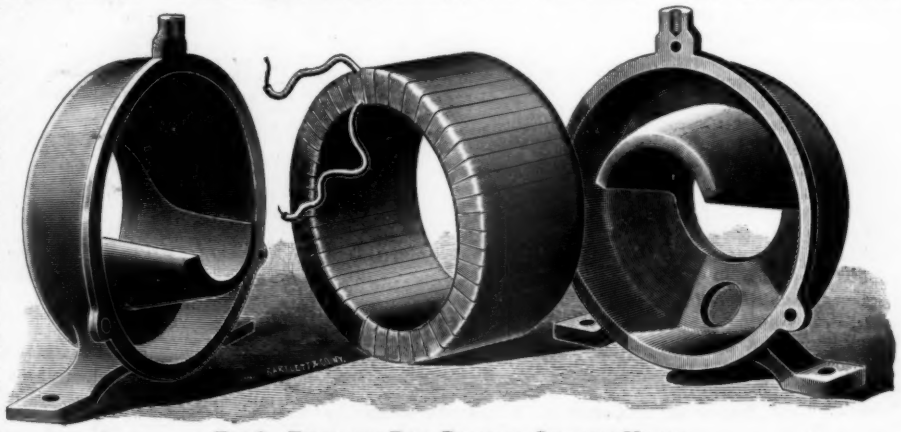


FIG. 6.—FIELD AND POLE PIECES OF LUNDELL MOTOR.

Electric Light Engines for Steamboats.

When contracting for electric light plants for the fine new steamers of the Menominee Transit Company, Cleveland, O., Chief-Engineer Calder required, as a preliminary condition, that special engine designs be submitted. It is frequently necessary, in boat work, to provide the engine with an iron subbase of strength and weight—one that will make the engine absolutely self-contained. Moreover, the governor must be especially easy of access, both for taking up and for lubrication, and be of such design and construction as to regulate within the least possible percentage while remaining insensible to the motion of the boat.

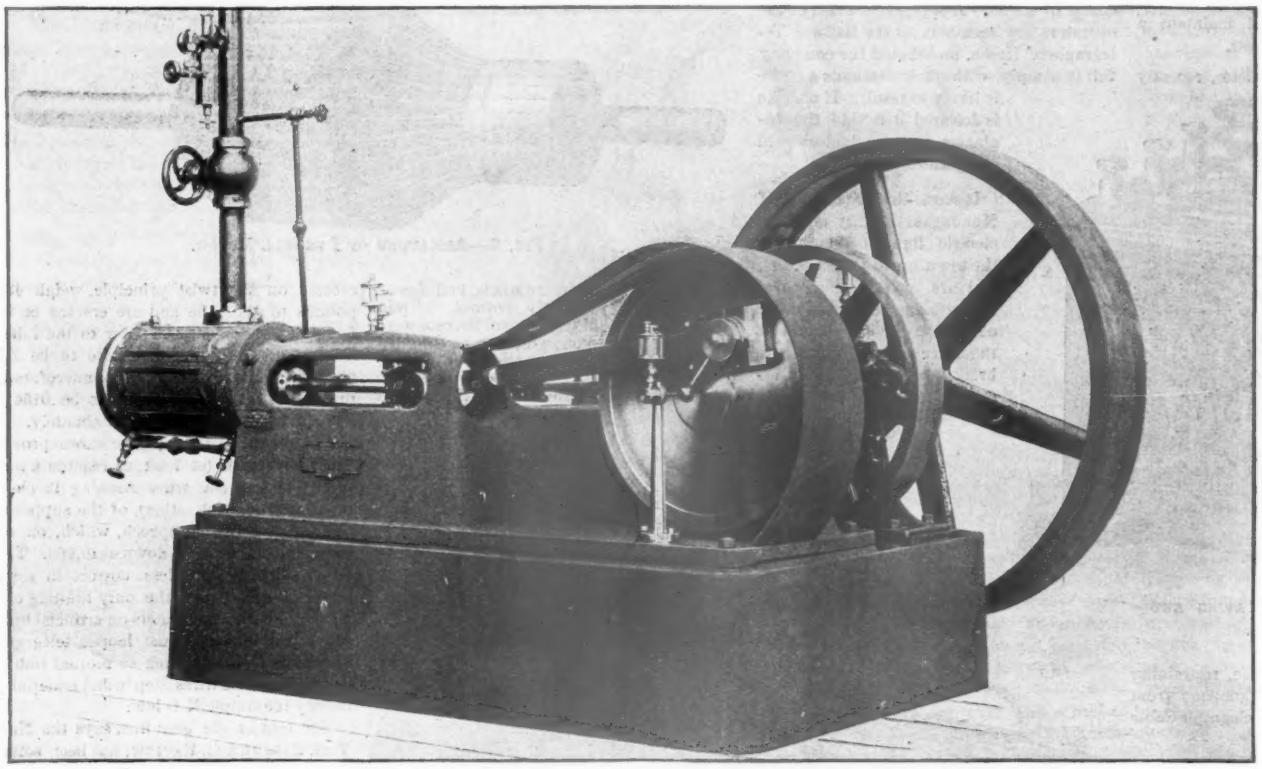


FIG. 1.—NOYE ENGINE, SPECIALLY DESIGNED FOR STEAMBOAT ELECTRIC LIGHT PLANTS.

To meet these conditions, the John T. Noye Manufacturing Company, of Buffalo, N. Y., submitted designs of the engine which we illustrate herewith, and these Mr. Calder accepted. Six engines were accordingly furnished, and as proof of their having completely "filled the bill," it can be said that they have needed no repairs or extra attention during the season, and are now, at its close, in perfect condition, although much of the time they have run with a steam pressure of 150 pounds, instead of the 100 allowed for by the builders.

These engines are of six-inch bore, 10-inch stroke, and run at 300 revolutions. The top of the fly-wheel turns toward the cylinder but can be made to run the other way, if desired. The governor is an adaptation of that used on the Noye heavy-duty B style engine, and ensures perfect regulation. Every engine is carefully tested and adjusted, and can be shipped complete without affecting the adjustments. Other particulars may be obtained of the John T. Noye Manufacturing Company, Buffalo, N. Y.

In Aguilar, Spain, severe thunderstorms have thoroughly frightened the inhabitants and in some cases lightning fused some electric light conductors. Fearing that the presence of these wires had a malign influence on the town, some of the natives promptly cut down a portion of the electric light company's system of poles.

The Electrical Habits of Iron.

(London Industries.)

It is strange how little is known about the loss of power in iron under reversals of magnetization. It has been known for many years that energy was lost when iron was magnetized and demagnetized, but the builders of dynamos had no clear ideas on the subject. Seven years ago Professor Ewing and Dr. Hopkinson called attention to the loss of energy by hysteresis, apart from foucault currents; but since then no information of any practical importance has been added. It seems as if everything connected with alternating currents is doomed to go through a period of barren quasi-scientific treatment before being studied and utilized by electrical engineers. The quasi-scientific method of treating iron is to take curves with a ballistic galvanometer. This is a cumbrous method, and does not give the information required. The engineer really wants to know what kind of iron gives least loss by hysteresis, what maximum induction does it pay best to employ, and how much energy is wasted per cubic centimetre per cycle. To test a given sample the obvious way is to make a little choking coil of it, and to measure the power lost by means of a watt-meter. This gives the information at once as regards that sample. If readings are taken at different electromotive forces, the losses at different inductions are obtained. The ballistic galvanometer method is merely an indirect and, perhaps, inaccurate way of arriving at the same result. Finding the qualities of different samples is a very small matter. The chief difficulty is to find good qualities of iron at reasonable prices, and what is wanted is the knowledge of the causes that go to make iron and mild steel good or bad. Makers of iron do not generally know anything about hysteresis, and electricians know little about iron; but it is no use shirking the subject and reading papers to scientific societies about curves belonging to specimens obtained at random from unknown sources. Reams of paper have been covered with researches on curves of random samples, and they are absolutely useless. They may be of scientific interest; if so, well and good, but they are generally supposed to be for the benefit of the benighted and ungrateful practical man. So far all the information the dynamo maker has is that soft iron has comparatively little loss by hysteresis, and he pins his faith on some particular merchant who supplies him with a metal which he calls "best Swedish charcoal iron," but which is not generally labeled "Made in Sweden."

A few investigators have given the analyses of their samples; but we do not know whether the percentage of carbon is the salient quality, or whether minute traces of other substances increase or decrease the loss of power. Neither do we know how the treatment of the iron in rolling and annealing affects the magnetic properties. If investigators could only be induced to consider what practical people want to know, instead of what "looks deep in print," some useful information might be obtained.

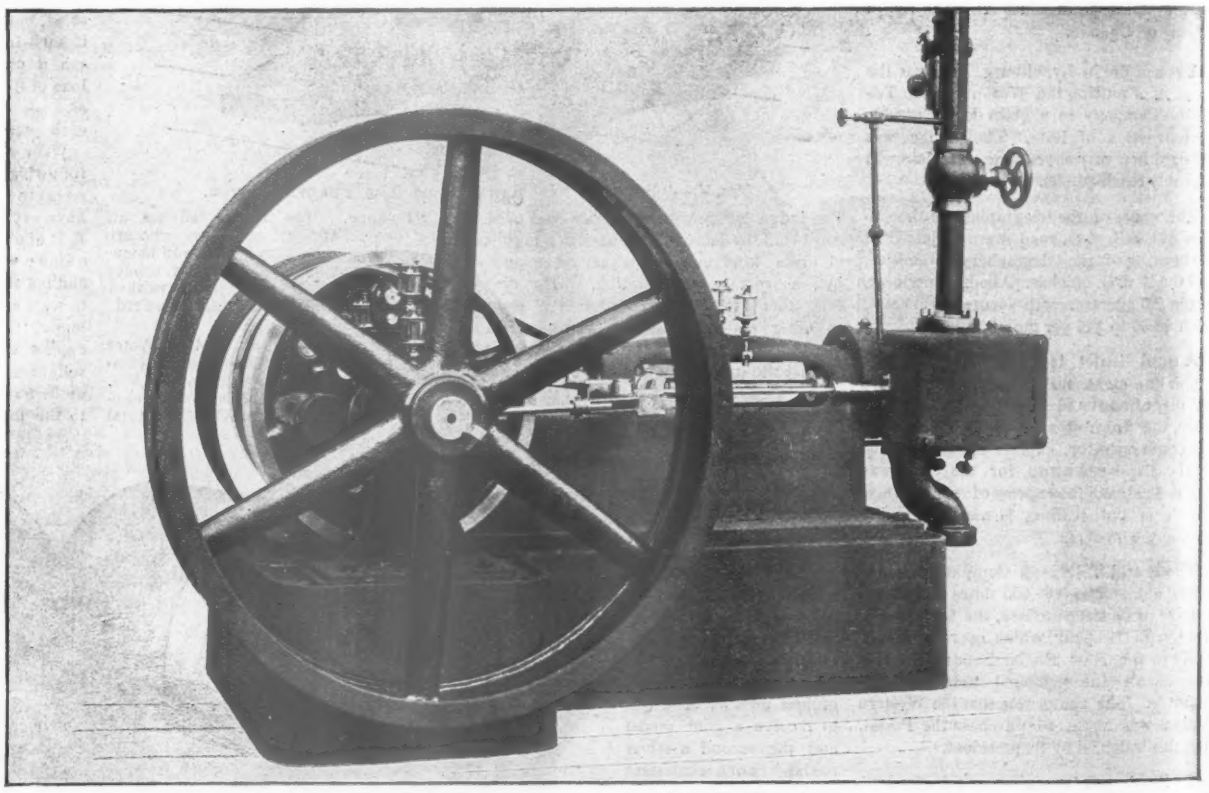


FIG. 2.—ANOTHER VIEW OF SPECIALLY DESIGNED ENGINE OF THE JOHN T. NOYE MANUFACTURING COMPANY, BUFFALO.

The Hardworking and Patient Telephone Operator.

Don't kick about the telephone girl. She is like the musician (?) at a country dance—she does the best she can; angels can do no more. She can't get everybody for you when they are talking to some one else. She can't make your wire work when it is crossed. She can't overcome many of the difficulties that are liable to happen almost any day. Generally she does better than you give her credit for. Go to the central office and see how deftly she manipulates the switches and connections. Imagine yourself in her place and then wonder at the perfection of the system and the rapidity with which she performs her monotonous duty.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

MARSEILLES, ILL.—The Marseilles Electric Street Railway Company has certified to a change of object, so as to permit the company to operate its cars by electricity.

HAMILTON, CAN.—Improvements and extensions to the street railway system will be made by the Hamilton Street Railway Company. This company has applied to the Ontario Legislature to have its act of incorporation amended so as to enable the company to increase its borrowing powers.

GARDINER, ME.—The Augusta, Hallowell and Gardiner Electric Railroad Company will petition the legislature to change its charter so as to enable the company to extend its line in Gardiner, and also empower it to furnish light, heat and power.

READING, PA.—The City Passenger Railway Company has made application to use the trolley system.

NEW ORLEANS, LA.—The Canal and Audubon Street Railway Company has been incorporated with a capital of $2,000,000. Directors, R. T. McDonald, M. J. Hart, S. J. Hart and P. Roynes.

BRAZIL, IND.—An electric street car construction company proposes to build an electric line from this city to Harmony.

VICKSBURG, MISS.—The franchise for an electric street railroad granted by the city council to McFarland-Fuller syndicate has been transferred to C. R. McFarland alone, Mr. Fuller failing to provide the funds for building the road.

BRIGANTINE BEACH, N. J.—A franchise has been granted to I. Rush Ritter, of Brigantine, to run a new electric railway to Brigantine Beach, which will connect by steamboat with Atlantic City.

EAST ST. LOUIS, ILL.—The Edward Thomas Electric Railway Company will commence building a new electric road to East St. Louis as soon as right of way can be secured.

MICHIGAN CITY, IND.—The Lake Cities Electric Railway Company, to build electric railways in this city and suburban towns, has been incorporated by A. N. Hatch, W. C. Nichols, H. T. Hart and others, with a capital of $200,000.

LEWISTON, ME.—A party of Lewiston and Portland capitalists are arranging to petition the next legislature for a charter to run an electric railroad from Lewiston to Mechanic Falls.

POUGHKEEPSIE, N. Y.—The Poughkeepsie and Wappinger Falls Short Surface Railroad Company; capital, $100,000. Incorporators, J. W. Hinchley, Thomas J. Swift, Peter B. Hoyt, T. F. Lawlor and John P. Wilson.

STILLWATER, N. Y.—Part of the stock of the Stillwater and Mechanicville Street Railroad has for some time been controlled by the bank of D. Powers & Sons, of Lansingburgh. Mr. Powers and others have formed a new company and will make application to change the motive power to electricity.

YONKERS, N. Y.—The Yonkers Railroad Company, the Eastchester Railroad Company, the New Rochelle Railroad Company and the Gean Electric Railway Company, of Mount Vernon, have consolidated and will operate an electric railway system between Yonkers and Mount Vernon and the Sound.

ELYRIA, OHIO.—Elyria wants an electric railroad to connect the east, west and south ends of the town. A company with that object in view could secure a valuable franchise.

BRISTOL, PA.—The Bristol and Newtown Street Railway Company; capital, $100,000. Incorporators, Geo. F. Pierson, Chas. H. Davis and Edwin Chamberlain, of Philadelphia, and A. C. Milliken, of Pottsville.

MONTREAL, CAN.—The Grand Trunk Company is considering the matter of operating its tunnel between Port Huron and Sarnia by electric motors. The company has sent a number of experts to Baltimore, to examine the workings of the Baltimore and Ohio electric system.

ATLANTIC HIGHLANDS, N. J.—Application has been made to the borough council for a franchise to run electric motor cars through the principal avenues of the town.

BROOKLYN, N. Y.—The Broadway Railroad Company, since the change in its management, has decided to introduce electricity.

NEW HAVEN, CONN.—The State Street and Whitney Avenue Railroad Companies have been granted franchises to equip their lines with electricity.

COLUMBUS, OHIO.—The Columbus, Grand View and Suburban Street Railway Company; capital, $50,000. Incorporators, A. D. Heffner, Edmund Denmead, Fred. H. Croughton and John Calendar.

DRAVOSBURGH, PA.—Dravosburgh Electrical Railway Company; runs from Reynoldton, Alleghany County, Pa., to Dravosburg in the same county; length, two miles; capital, $15,000. Jno. M. Risher, president; S. S. Crump, secretary, Dravosburgh.

BRISTOL, PA.—The Bristol and Newtown Street Railway Company; length, 10 miles; capital, $100,000; runs from Bristol, Bucks County, Pa., to Newtown in the same county. H. C. Milliken, president, Pottsville, Pa., owns one-half of the stock; Geo. F. Pierson, secretary, Philadelphia; office, Bristol, Pa.

TACOMA, WASH.—The Rapid Transit Company, capital $700,000, has been organized to build an electric street railway, and is an applicant for a franchise. S. C. Slaughter, Wm. R. Rust, and Horatio C. Clement, are the incorporators.

WHITE FISH BAY, WIS.—The Village Board is considering the question of granting an electric railway franchise to a company of local capitalists, headed by C. R. Gathe.

FLATLANDS, N. Y.—The Flatlands Electric Light and Power Company; capital, $50,000. Incorporators, M. L. Towns and others, of Brooklyn.

BROOKLYN, N. Y.—The Kings County Electric Railway Company; capital, $650,000. Directors, James F. Casey, of Albany; Michael Bergen, of Paterson, N. J., and James Jackson, of New York City.

TOLEDO, OHIO.—The Toledo Electric Street Railway Company has increased its capital stock from $800,000 to $1,400,000.

KITTERY, ME.—It is reported that an electric railway will be built from this town to York Beach by a stock company.

ATLANTA, GA.—The Atlanta City Street Railway Company, will begin work at once on the construction of an electric railway from Atlanta to Decatur.

THOMPSONVILLE, CONN.—Notice has been given of application to the Connecticut Legislature for permission to build an electric railroad from Enfield to Windsor and East Hartford.

BOULDER, COLO.—The Mehallin Electric and Extraction Company; capital, $100,000. Directors, W. K. Mehallin, George B. Chaney and Eugene Otis. The object of the company is to establish the Mehallin electro-deposition process for treating ores and for heating and lighting.

PALMYRA, N. J.—The Cinnaminson Electric Company has been organized by Philadelphia capitalists who propose to furnish electric light to Palmyra, Riverton and adjoining towns.

SAVANNAH, GA.—The Electric and Supply Company; capital, $5,000. Incorporators, Gustave Fox, W. H. Drew and Henry Urban.

MILWAUKEE, WIS.—George J. Melms has been appointed receiver of the Milwaukee Electric Railway Company. This is the last legal step taken by the Villard syndicate to get possession of the only road in the city not already owned by it.

EVERETT, PA.—The Everett Light, Heat and Power Company, with a capital of $15,000, has been chartered.

Electric Light and Power.

CHICAGO, ILL.—The Climax Electric Light Company is the name of a new corporation with a capital of $100,000. Incorporators, John R. Bensley, Geo. F. Watson and A. J. Vaughn.

SYRACUSE, N. Y.—The Onondaga Electrical Company will erect a plant to cost $250,000, and to be in operation May 1.

DILLON, MONT.—The Northwest General Electric Company has purchased a plot of ground for the location of an electric light plant.

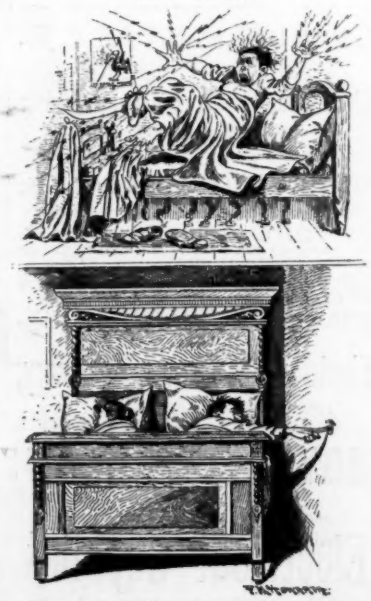
CLEVELAND, OHIO.—A consolidation or working agreement has recently been effected by the Cleveland Electric Light Company, the Brush Electric Light and Power Company and the Cleveland General Electric Company. The electric light wires will be extended throughout the city, and $1,000,000, if necessary, will be expended to improve the system. A large power house will be built down town. There will be a new management for the consolidated companies, and it is understood that the General Electric Company, of New York, is largely interested in the new management.

New Manufacturing Companies.

CHICAGO, ILL.—James A. McEntree, William Pettis and Chas. Aldworth have incorporated the McEntree Electric Company, with a capital of $10,000.

ANOTHER USE FOR ELECTRICITY.

[THERE IS NOW NO EXCUSE FOR YOUR COOK SLEEPING OVER TIME.]



You press the button and that breaks her rest.—*Puck.*

ELECTRIC RAILWAY AND POWER NOTES.

The new electric road in Easton, Pa., was opened last week.

The largest electric locomotive yet built, calculated to develop 2,000 horse-power, has just been finished at Baden, Zurich.

There is a scheme afoot to run an electric street railway along the canal from St. Mary's, Mercer County, O., to Cincinnati.

Electric car heaters have been installed in the cars in Toledo, Ohio. They are manufactured by the Toledo Electric Heating Company.

The storage battery cars of North Purchase, R. I., has been making 100 miles daily and last month 2,500 miles were covered without an accident or a delay.

In Boston the General Electric Company has already orders for five electric locomotives from well established railroads, three of them to be of 16,000 horse-power each.

Judge Harry White, of Indiana, is at the head of a project which has in view the construction of an electric railroad between the towns of Indiana and Punxsutawney. The estimated cost is $300,000.

In Raleigh, N. C., conductors have been done away with and the passengers are required to deposit their fares in the box as before. Evidently in Raleigh conductors are considered quite a luxury.

The electric road to connect Webb City and Carterville with Joplin, Mo., will be completed early in the spring. It is expected that it will be one of the best equipped lines in the country. Capitalists from Harrisburg, Pa., are promoting the enterprise.

A New England newspaper alludes to the opening of the electrical street railway in the following burst of oratory. "Away down in the southeastern corner of the State a halo of glory overspreads the horizon, and the word 'Progress' is written on the clouds like a mighty advertisement on the rock of the hillsides."

In Milford, Mass., it was shown that a storage battery street-car, holding 70 passengers, can travel 30 miles an hour, making stoppages, rounding curves and climbing hills. The distance is not stated, but results have proved that the route is such as to allow of the storage battery system being employed for the round trip without recharging.

The western blizzard last week visited New England and in New Haven it was especially severe. Traffic was seriously interfered with on the electric roads, but the worst sufferers by the storm were the employés of the company. The position of motorman on a cold winter's night, when the wind, cold and sleet-ladened, blows in terrific blasts, is not one to be envied.

When the Niagara Falls Power Company has its wires through the city of Buffalo, the city will be supplied, it is said, with 120,000 horse power. It is expected that when the plant of the Canadian Company is completed it will be capable of furnishing 100,000 horse-power. This aggregate of 220,000 will be available at far cheaper rates than other power. Estimating the power now consumed in the city, about 100,000 horse-power, the city will be saved probably more than a million dollars a year. This money will, of course, be added to the general wealth of the city, and the benefits thus derived will place Buffalo among the most prominent manufacturing cities of the country.

Death of Jay Gould.

Mr. Jay Gould, the greatest financier of the century, the chief owner of the Western Union Telegraph Company, died suddenly Friday of last week. Consumption carried him off. Mr. Gould's fortune is estimated to be worth from $75,000,000 to $100,000,000, which is inherited by a family of three sons and two daughters.

KINDRED INTERESTS

The Non-Magnetic Watch is a popular time-piece with electrical people. Its non magnetic qualities are such that its time-keeping properties are not impaired by dynamos. This watch is now kept on sale by all leading jewelers and clock dealers, the head offices being in this city, at 177 Broadway, the controlling company being the Non-Magnetic Watch Company.

Queen & Company, of Philadelphia, are making a great noise about their Cardew voltmeters, which they say are as reliable as ever, and guaranteed accurate to one per cent. Desiring to reduce the stock of these goods, which is unusually large, they announce a special cut in prices to hold good only until January 1. It will pay interested parties, especially central station managers, to correspond with them and secure a copy of Circular No. 405, which gives further particulars.

The General Electric Company has secured the following contracts through the agency of Mr. C. A. Ross, of Kansas City: Seneca, Kansas, one 1,000 light, 16 candle-power, incandescent; Columbus, Kansas, one 500 light, 16 candle-power, incandescent; Springfield, Mo., one 1,000 light, 16 candle-power, incandescent; Galena, Kansas, one 500 light, 16 candle-power, incandescent; 2,000 candle-power, 30 light arc. These contracts were closed in the last 60 days and speak well for the business ability of the manager of the Kansas City branch of the company.

The Shultz Belting Company, of St. Louis, have recently secured some desirable orders for their standard brands of belting, and the territories from which the orders come show that the Shultz belt is world famous. Among these contracts may be mentioned orders for two 54-inch double belts for the Union Depot Street Railway Company, of St. Louis, which are to replace oak belting now in use; a complete belt equipment for the Stamford, Conn., Street Railway and Electric Light Company; belts for the Elizabeth, New Jersey, Electric Light Company; two 14-inch belts for the Salt Lake City, Utah, Electric Light Company; one 15-inch belt for the Butte City, Montana, Electric Light Company; 6,000 feet of belting, including a large order for dynamo belts, to go to England. It may be said, in passing, that Shultz belts are giving satisfactory service in Moscow, Russia; Cairo, Egypt, and many Central American cities, as well as in every state of the Union.

The Finances of the General Electric Company.

(*From Boston News-Bureau.*)

It can be authoritatively stated that the General Electric's issue of $6,000,000 bonds is for nothing else than the general purposes of the company, whose management means to be entirely forehanded.

Of course, the General Electric, with $30,000,000 of common stock, $10,000,000 of bonds and its preferred stock and subsidiary companies, will represent $50,000,000 of earning capital, more or less of which must at all times be in General Electric securities, as well as in factories and goods in transit. There are many security assets which the management has determined it is better policy to keep than to sell. The Bell Telephone Company, in its early days, sold stock in local companies, which it afterwards bought back at a large advance. The General Electric management does not intend to make this mistake, and the parent electric company considers it good policy to hold some stock interests which cost it nothing, but which are now worth a considerable premium above par. The General Electric Company is drawing stock and bond bonuses from scores of companies, besides receiving manufacturing profits on apparatus sold.

Society of Naval Architects and Marine Engineers.

The most prominent and influential men in the shipbuilding and shipping interests of the United States have completed the preliminary organization of a professional society, to be called the Society of Naval Architects and Marine Engineers, whose object will be to promote the art of shipbuilding in all its branches, both commercial and naval. The committee of organization, consisting of Wm. H. Webb, of New York, Lewis Nixon, general manager of Cramp's Shipbuilding Company, of Philadelphia, Col. E. A. Stevens, of Hoboken, Francis T. Bowles, Naval Constructor, United States Navy, and (*ex-officio*) Clement A. Griscom, president of the International Navigation Company, expect to incorporate the society in New York and are now sending out invitations to membership.

The list of those who have accepted positions in the preliminary organization include many well known names from all sections of the country: President, Clement A. Griscom; vice-presidents, T. D. Wilson, chief constructor of the navy; Chas. H. Cramp, president Wm. Cramp & Sons Shipbuilding Company; Geo. W. Melville, engineer-in-chief United States Navy; George W. Quintard, New York; Irving M. Scott, president Union Iron Works, San Francisco; Gen. Francis A. Walker, Boston; W. H. Webb, New York. The members of the council include, H. T. Gause, Wilmington, Del; F. W. Wheeler, West Bay City, Mich.; W. H. Jaques; Gen. T. W. Hyde, Bath, Me.; J. W. Miller, New York; C. H. Orcutt, president Newport News Shipbuilding Company; Nat G. Herreshoff; J. F. Pankhurst, Cleveland, Ohio; Naval Constructors Hichbord and Fernald, of the navy; Chas. H. Boring, ex-engineer-in-chief; Commanders Chadwick and Sampson, of the navy; Harrington Putnam, of New York; Assistant Naval Constructor W. L. Capps being secretary and treasurer.

In consideration of the increasing importance of our shipbuilding interests and the development of the navy, the organization of this society upon a basis similar to that of the civil engineers and kindred professions is regarded as opportune and having a valuable and extended field of influence in technical subjects and public affairs.

Societies similar to this exist in England, Scotland, France and other European countries, and their influence in the development of naval architecture, marine engineering and allied professions has been felt in a marked degree. The foreign societies include among their officers and members the foremost shipbuilders, engineers, shipowners, naval officers, members of Parliament and other public men interested in shipping.

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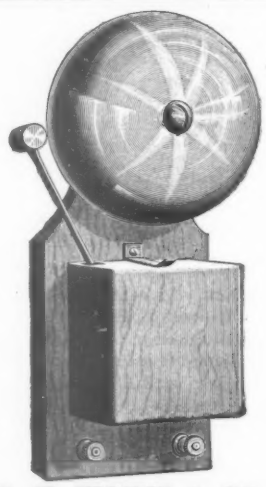
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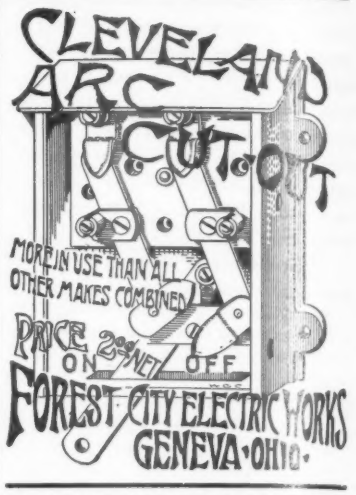

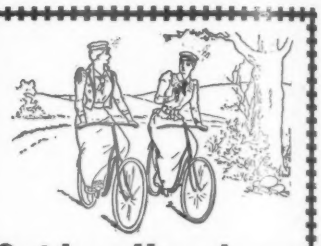
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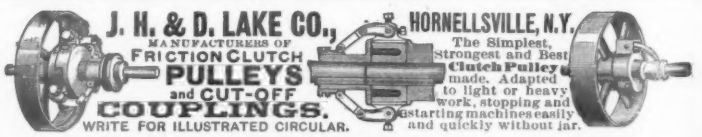
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